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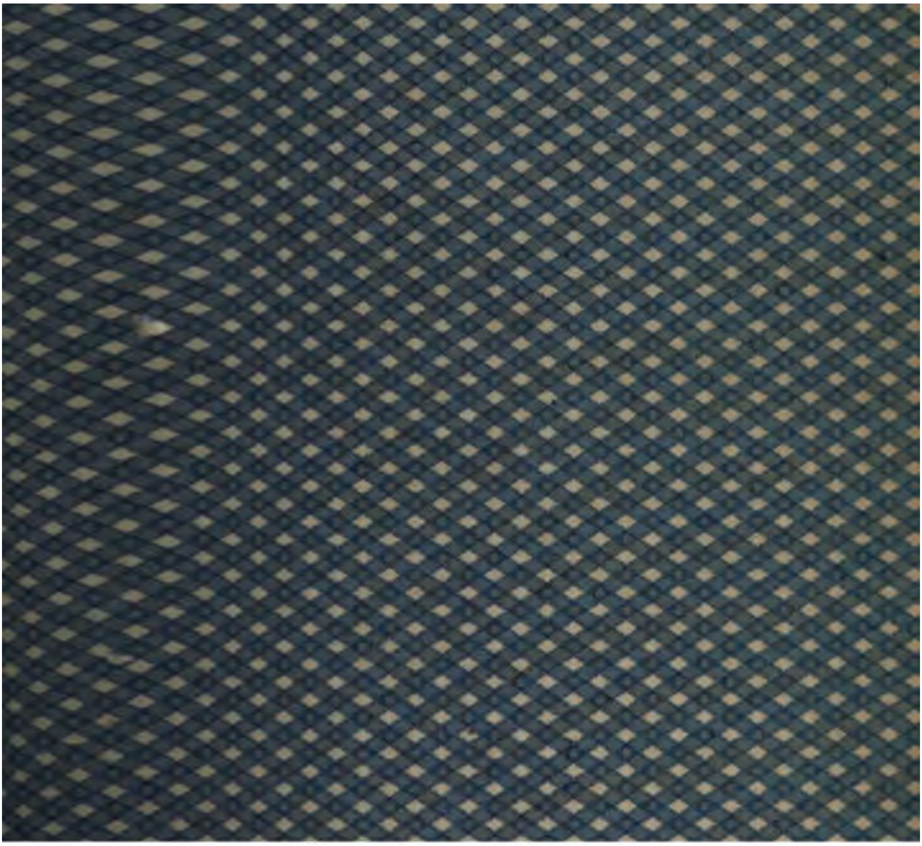

E. S. O'Brien.
April 30th 1879.

Dr. E. S. O'Brien.

DEFORMITIES AFTER FRACTURES.

DEFORMITIES AFTER FRACTURES

BY

FRANK HASTINGS HAMILTON.

> "THAT a 'cure' took place we do not doubt, but the information we should most desire would be o the length of the cured limb, and on a few other matters of that sort."
>
> JOHNSON'S REPLY TO RADLEY.

EXTRACTED FROM THE
TRANSACTIONS OF THE AMERICAN MEDICAL ASSOCIATION.

PHILADELPHIA:
T. K. AND P. G. COLLINS, PRINTERS.
1855.

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PREFACE.

I PROPOSE to deduce from my own experience, and from the experience of other surgeons, as recorded in this report, the true prognosis of fractures. This I shall endeavor to do with care and fidelity, avoiding, on the one hand, if possible, the error of encouraging the practitioner with a prognosis too favorable, and, on the other, the equal wrong of leaving him to expect too little.

To this end, I shall draw from my hospital and private records such cases as have come under my immediate care, describing, as briefly as will be consistent with my purpose, all those circumstances connected with each fracture which might in any way modify the result, together with the plan of treatment, and finally, the precise amount and character of the imperfection, or maiming, if any, which remains. I shall not, however, confine myself to my own cases; but, so far as I am able, I shall record the cases which have been treated by other regularly qualified surgeons, and which have subsequently passed under my own observation. This is necessary not only as a vindication of my own practice and reputation, of which one must naturally feel jealous, but more especially that my conclusions may have, what you have a right to demand for them, the weight of authority.

I shall, therefore, ask the liberty of reporting the practice of my contemporaries, and of mentioning their names, that you may judge for yourselves whether they constitute proper representatives of the present condition of our art. Of this, I trust, no one will complain, since without such permission I would not have ventured upon the duty assigned me, nor do I believe any one else would have consented to have occupied my place.

It is certain that, up to this moment, no one has volunteered to state fully what have been the results in his own practice, or in the practice of the hospital, or other similar institutions, which have been under his immediate charge. In hospital records, you may find patients admitted with fractures, and reported as "dead," or as

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dismissed "cured," with the occasional interpolation of "a good leg;" and, upon these records, tables have been constructed to determine the average fatality of such accidents, and the probabilities of cure; but I have not yet seen any published reports declaring what was the exact amount and value of the "cure"—how much the bone was shortened, or bent, or otherwise maimed and deformed. In short, they still fail to inform us what are the "deformities after fractures," which, under fair treatment, may reasonably be expected.

Dr. Wallace published, in 1839, a statistical account of the eighteen hundred fractures which had been treated in the Pennsylvania Hospital from its foundation up to the year 1838; and Dr. Norris published, soon after, a similar report of the fractures treated in the same institution between the years 1830 and 1839, inclusive; but neither of these gentlemen make any reference to a shortening, or to any degree of deformity which may have occurred in the cases reported as cured. Dr. Peirson, in his report of the statistical tables of all the fractures which had occurred in the Massachusetts General Hospital up to the year 1840, notices, under the head of "Remarks," many interesting facts, such as delayed or non-union, the occurrence of ulcers, gangrene, &c. &c.; but there is nothing exactly pertinent to the subject of our inquiry.

Dr. Lente, who has recorded the statistics of fractures treated at the New York Hospital for the twelve years preceding 1851, has attempted to supply the deficiency, which he declares does exist in the hospital records, upon this subject, by his own "personal experience of several years in the practice of the hospital, and by conversation with other surgeons who have been connected with it." But he has limited his statements to what he believes to have been the average results, as regards shortening, in the treatment of fractures of the femur.

The statistics furnished by Lonsdale, of the Middlesex Hospital of London, and by Fricke, of the General Hospital at Hamburg, are equally silent upon the subject of deformities or shortening.

The same disinclination to approach this subject is manifested by those who have written special or general treatises upon fractures, and who, with the single exception of Malgaigne, will be found either to have ignored prognosis altogether, or they have seemed to speak of it only casually, and without any numerical basis for their calculations, since, among writers of equal experience and reputation, there exist the widest discrepancies of opinion. An example will illustrate what I have said. Chelius, writing of fractures of the thigh-bone, says: "Fracture of the thigh-bone is always a severe accident, as the broken bones are retained in proper contact with great difficulty. The cure takes place most commonly with deformity and shortening of the limb, especially in oblique fractures, and those which occur in the upper and lower third of the thigh-bone." To which Mr. South, the translator, and Surgeon to St. Thomas's Hospital, appends the following note: "In simple fractures of the thigh-bone, except with great obliquity, I have rarely found difficulty in retaining the broken ends in place, and in effecting the union without deformity, and with very little, and sometimes without any, shortening. For the contrary results the medical attendant is mostly to be blamed, as they are usually consequent on his own carelessness or ignorance." (*Chelius's Surgery*, by South, American edition, vol. i. p. 627.)

Even Malgaigne, to whose recent work, entitled, *Traité des Fractures et des Luxations*, I shall hereafter have frequent occasion to refer, and who speaks generally with a precision which indicates a careful observation of the facts, does not intimate the existence of any exact records, either in his own practice or in the practice of others, from which his conclusions have been deduced.

In looking for an explanation of this seeming indifference, or palpable ignorance, upon a subject of such manifest importance both to surgeons and to their patients, I find several probable causes.

I suppose that most practical surgeons have a tolerably correct appreciation of prognosis in fractures. I say tolerably, because I wish to imply a qualification. I do not think that a majority of even "practical" surgeons have a full appreciation of the subject. I am frank to confess that, until I commenced these investigations, I had not any just notions of the frequency of deformities after fractures. Nor can I now understand how any surgeon, who does not carefully measure limbs with a rule or with a graduated tape-line, can have possessed himself of any very accurate information upon that point. Yet I appeal to surgeons whether this has been their constant or even their general practice? or whether they have not usually adopted, in measuring the lower extremities, that more simple, yet always unreliable method of placing the limbs parallel, knee to knee and heel to heel? or whether they have not as often contented themselves with the averment of the patient himself, that the limb was perfect? and, indeed, whether, in case of a fractured arm or radius and ulna, they have, in one case out of ten, instituted any sort of inquiry or examination by which their relative length might be determined?* I address hospital surgeons as well as surgeons in private practice. Let them answer to themselves these interrogatories. If such examinations can be shown to have occasionally been made, we still venture to affirm that, in no instance, for any considerable length of time, have regular records of exact results been kept. Nor do I expect that, upon my humble remonstrance, such records, fairly made, will hereafter be kept.

Surgeons who have the charge of public hospitals understand that the eyes of their pupils, their governors, their confrères, and of the public even are upon them, and it is attributing to them nothing more than a common frailty to charge that they dare not record faithfully their results in the treatment of fractures. To be honest in the admission of shortcomings in a branch of our art, where the difficulties are so little understood by those who constitute themselves our judges, would be suicidal. Do you not see that jealous and designing colleagues would have no such discreditable results? Pupils would draw unfavorable comparisons, and desert the wards where failures were so common; rival hospitals would secretly or openly seize upon such records to their own advantage; and the patients themselves would, no doubt, often return the diligence, skill, and honesty of their surgeons with imprecations and prosecutions.

There is, gentlemen, no lack of charity in these suppositions. We are to take men as they are, and as they are well enough known to be, and not as we would have them; and it is in vain to deny that such are the fair risks which strict honesty in this matter must incur. The instinct of self-preservation, therefore, prompts to silence, or to the most favorable representations. Students will continue to go out from our hospitals with a belief that perfect union of broken bones is the rule, and that exceptions imply generally unskilful management; and if, when hereafter they have themselves occasion to treat a fractured femur, the result falls short of their standard of perfect success, they, taught also by the same instinct of self-preservation which actuated their teachers, will conceal the truth from others, and even from themselves, if possible. Nay, I fear that sometimes, under the same urgent promptings, and where the moral sense is not superior to all other considerations, they may hesitate to regard the sanctity of an oath! How else shall we explain the testimony of that man who, with uplifted hand, affirms that he has "seen and treated ten fractures of the femur, in adult persons, and not one of them is in any way shortened or deformed?" Or what less charitable construction will you place upon the published averment of a hospital surgeon in a neighboring province, who, in his remarks upon my "fracture tables," as reported by my late pupil, Dr. Boardman, some years ago, declares that he has lately treated at the hospital under his care one case of fractured inferior maxilla; three cases of broken clavicles, two of which were at the outer third; seven of fractured femur, one of which was compound and one comminuted; eight cases of fracture of the tibia and fibula, two of which were comminuted and one compound—in all nineteen cases, and that, with the exception of one who died, *every case resulted in a perfect cure?*

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* "Le malheur de tous ceux qui ont cru obtenir de ces guérisons miraculeuses, c'est qu'ils n'ont pas même songé à mésurer comparativement les deux membres; je dirai plus, c'est qu'ils ignorent le plus souvent les conditions d'une bonne et fidèle mensuration."—*Traité des Fractures et des Luxations*, par J. F. Malgaigne, tom. i. p. 724. A Paris, 1847.

It is more than probable that the writer will not escape similar criticisms hereafter, and that his report may be regarded as giving a true representation of American surgery, but as scarcely applicable to the surgery of others. In reply to a sentiment so illiberal, I beg to say, in anticipation, that having myself visited a majority of the large hospitals of Great Britain, and very many upon the continent of Europe, and having observed carefully their methods of treatment, and, in some measure, noticed their success, I am prepared to affirm that, in so far as I have yet seen, the practice of American surgeons, in the management of fractures, compares favorably with that of any other people. The English themselves are constantly proclaiming their deficiency in this department of surgery. It is now more than one hundred years since Pott, then Surgeon to St. Bartholomew's Hospital, inquired of his brethren if it was not "notorious" that in England broken thighs and legs were "often, *very* often, left deformed, crooked, and shortened?" But, notwithstanding Pott believed that he had discovered the true cause of these deformities, and had devised a remedy which must in future secure to his countrymen comparative eminence in this branch, yet to-day Mr. Skey, the very distinguished successor of Mr. Pott in the same great hospital, finds occasion to say: "One is therefore at a loss to find any apology for those surgeons to whose want of care, and even of humanity, may be attributed *the numerous examples of* *distorted and contracted members, which have cast a reproach on the surgery of Great Britain.*" (*Skey's Operative Surgery*, American edition, p. 140.)

For myself, while I take these admissions as evidence that Americans are quite as expert in the dressing of broken bones as the English, I am nevertheless much more charitable to their failures than they are themselves. To me these admissions only confirm a long-nourished conviction that neither in Great Britain nor in the United States, nor in any other part of the world, has the art of treating fractures attained that degree of perfection which surgeons have almost universally claimed for it.

If my reviewers deny the correctness of my conclusions, I trust they will do me the justice to accompany their denial with proofs of the same specific character, and obtained in the same careful manner, with those evidences which I shall present.

Finally, no man can be more sensible than myself of the imperfect manner in which I have accomplished the duty which you have imposed upon me, and especially since, while I have only contributed a limited experience to the elucidation of a very important subject—the subject of Prognosis in Fractures—I have, to an extent still more limited, contributed suggestions or experience in relation to better or more successful modes of treatment. Yet I trust no one will, for that cause, censure an humble beginning. Others may yet complete what I have only commenced. "Admit that bones and patients are and always have been contumacious and refractory. What then? "What good," do you ask, "can be accomplished by exposing our failures, unless we have found the remedy, in which alone the world can claim a final interest?" I reply, that the first step towards improvement in any art or science must be the faithful exposure of its wants and deficiencies.

CHAPTER I.

OSSA NASI.

CASE 1. *Simple displacement of left os nasi, laterally and backwards. Partial restoration.*

S. L., of Auburn, aged 10 years. While playing, one of his mates accidentally hit him with his elbow upon the left side of his nose. I was immediately called, and found the lower end of the left os nasi displaced laterally and backwards, so that it rested under the lower end of the right os nasi. There did not appear to be any fracture beyond that which was inevitable by the mere separation of its serrated margins from the bones adjoining.

With a steel instrument, introduced into the left nostril, I attempted to lift the bone to its place. The membrane was very sensitive, and the patient very restless under my repeated efforts. I pressed upwards with considerable force, and succeeded at length in bringing the bone nearly into position. In this situation, with some slight deformity remaining, I was compelled to leave it.

The hemorrhage, which was for a time profuse, soon ceased spontaneously.

CASE 2. *Simple fracture or displacement of the ossa nasi. Permanent deformity.*

M. L. P. T., of Saratoga County, aged 5 years, was struck by a boy's sled on the left side, completely flattening his nose, and turning the bones across to the right. Dr. John Thompson, a distinguished surgeon of Saratoga County, was in attendance, and, as well as it was possible to do so, lifted and replaced the nasal bones. For some months it was supposed that the restoration was perfect, and not until all swelling had disappeared was it ascertained to be still considerably displaced.

Thirty-six years after the accident I examined the nose. I find the ossa nasi are inclined over to the right, the deviation being in a straight line, and commencing at their upper ends. It is, therefore, a displacement, rather than a fracture. The left nostril is very much obstructed, and has been all his life a source of much inconvenience. Within a few years, also, a cartilaginous growth in the left nostril has materially increased the obstruction.

CASE 3. *Simple fracture and displacement of the lower third of the right os nasi. Restoration after one week.*

D., of Attica, aged 11 years. The lower third of the right os nasi was broken, and displaced to the right side. The accident occurred a week since, and an attempt was immediately made, by an intelligent country surgeon, to replace the bones, but without success. The doctor then directed him to call upon me.

I introduced a strong steel instrument into the right nostril, and pressed upward and to the left, while with my thumb I pressed forcibly upon the right side of the nose. My object was to lift the bone, and carry it a little over to the left side. During the effort, the bones were felt to crack and give way slightly, but not sufficiently. I then gave him chloroform, as the manipulation had proved very painful, and again pressed in the same manner and with great force. The restoration now seemed nearly or quite complete.

CASE 4. *Simple fracture and displacement of the lower ends of the ossa nasi to the left side. Attempts at reduction unsuccessful. Deformity remains. Chronic ulceration of the septum, &c.*

N. B. N., of Hunt's Hollow, aged 27 years. Two years since he was struck accidentally upon the right side of his nose by a board, and the ossa nasi were displaced to the left. A surgeon made an attempt to reduce them, but did not succeed, and they have remained displaced ever since.

The nose for a time was much swollen. A few months after the accident, a purulent discharge commenced from the right nostril, and at length an abscess formed in the right cheek. The abscess is now healed, but the nose continues to discharge pus, and occasionally it bleeds freely. There is a perforation of the septum, of the size of a three cent piece, which is continuing to enlarge.

No hereditary maladies in the family, except that, on his father's side, it has been generally observed that wounds do not heal kindly. The same is the fact with him. When a child, he was very subject to epistaxis; at sixteen, a pulmonary difficulty began, and he had more or less cough, with hæmoptysis, for two years. Since then his health has been good. He is a lawyer by profession, but of late he has lived in the country upon a farm, and has accustomed himself to much out-door exercise.

CASE 5. *Simple fracture, followed by deformity.*

Mrs. J. A., aged 23 years. Fifteen years ago she fell on her nose and broke down the ends of the ossa nasi. A surgeon of St. Gallen in Switzerland, replaced them.

There has remained ever since a slight elevation of the ends of the bones and of the cartilage, giving to her nose an aquiline form. The elevated portion is slightly tender, and occasionally, in damp weather, it is painful.

It is probable that, in replacing the fragments, they were lifted too high. Possibly, however, the slight deformity is due to an exostosis.

CASE 6. *Simple displacement of both ossa nasi backwards. No treatment. Deformity.*

Miss H. S., of Buffalo. When three weeks old, a block of wood fell upon her nose as she was lying in the cradle. The nature of the injury was not understood by the parents, and no surgeon was called.

The ossa nasi are now, twelve years after the accident, much wider than is natural, and depressed. The nasal processes of the superior maxilla appear to have been spread asunder. This having occurred when the bones were in a cartilaginous state, the parts must have been rather bent than fractured, and in this condition they have ossified. The deformity is very striking.

CASE 7. *Simple displacement of the lower ends of the ossa nasi backwards, complicated with fracture of the cranium and os femoris. Death on the seventh day. No attempt to restore the bones to place.*

W. W., aged 45 years, fell from a two-story building. Drs. White and Hamilton in attendance.

The ossa nasi were displaced rather than broken, being forced backwards from their articulations with the nasal processes of the superior maxilla, but not completely separated from their articulations with the os frontis.

As the injury to his skull was likely to prove fatal in a short time, no attempt was made to adjust the ossa nasi. He died on the seventh day.

CASE 8. *Simple displacement of the lower ends of the ossa nasi to the left side. No treatment. Displacement remains.*

Miss S. W., aged 8 years. She was struck accidentally, by a piece of iron, on the right side of her nose. Her parents did not suppose any serious injury was received, and no surgeon was called.

Ten years after the accident she called upon me for the purpose of having the deformity remedied, if possible. The lower ends of both ossa nasi are pushed over to the left side. I advised no interference.

CASE 9. *Simple displacement of lower ends of ossa nasi to left side. No treatment. Deformity remains.*

R. Jackson, aged 18 years. No surgeon was employed.

Ten years after the accident the deformity was very striking, both bones inclining to the left side.

CASE 10. *Simple displacement backwards of the lower ends of the ossa nasi. No treatment. Deformity.*

Henry Orb, aged 11 years. The accident occurred in Germany, and, his parents not suspecting the nature of the injury, no surgeon was called. Thirteen years after, he was an inmate of the Buffalo Hospital, and I found the bones very much displaced backwards.

CASE 11. *Simple displacement of lower ends of ossa nasi to the right. No treatment. Deformity.*

Wm. Hingston, aged 9 years. No surgeon was called. Eighteen years after the accident the displacement still continued.

CASE 12. *Simple fracture and displacement of lower ends of the ossa nasi to the left side. No treatment. Deformity continues.*

Mathew Powell, aged 19 years. This case came under my notice nine years after the accident, and the displacement still continued. He did not, at the time, suppose his nose was broken, and he did not consult a surgeon.

CASE 13. *Simple fracture and displacement of lower ends of the ossa nasi to the left and backwards. Treated by a "handy man" in Ireland. Deformity remains.*

Michael Gibson, aged 15 years, of Ireland. Michael called upon what, in that country, is known generally as a "handy man," or an uneducated "bone-setter."

Fifteen years after the accident, the fragments remained displaced

CASE 14. *Simple displacement of ossa nasi backwards. No treatment. Deformity continues.*

Jacob Kibbs, a German, aged 7 years, fell from a height of forty feet, striking on his face. His parents did not suspect the injury, and no surgeon was called. Twenty-four years after this he became an inmate of the Buffalo Hospital. The nose was then almost flat. The ossa nasi appeared unusually wide, and were sunken between the processes of the upper maxillary bones, which latter might be recognized by two parallel ridges on each side of the nose, rising above the level of the ossa nasi.

CASE 15. *Simple fracture and displacement of the lower ends of the ossa nasi to the left side. Treated by a "handy man" in Ireland. Deformity continues.*

Michael Kane, aged 30 years, of Ireland. This patient was treated also by a "handy man." Twenty years after the accident he was an inmate of the Buffalo Hospital. The deformity was then very striking. Lower ends of both bones incline to the left.

CASE 16. *Compound fracture and displacement of lower ends of both ossa nasi to left side and backwards. Complete restoration.*

George Reid, of Erie County, aged about 24 years. While employed in a sawmill he was struck by some part of the machinery, and was soon after found insensible. I saw him four hours after the accident. He could give no account of the injury, but it was evident that the blow which rendered him insensible had been received only upon his nose.

The ossa nasi were loose, and easily made to move under the fingers. The lower ends were pushed to the left side, and a little backwards. There was a wound on the right side communicating with the bones and with the nasal passages. The hemorrhage was profuse.

I introduced a straight steel instrument—a director—into the superior meatus, and, assisted by my fingers upon the outside, easily replaced the bones. With a small compress also placed upon the left side, supported by a strip of adhesive plaster, I sought to retain the bones in place. This was found necessary on account of a manifest tendency to fall off whenever the pressure was removed. The nostrils were plugged to arrest hemorrhages, and cold applications made to the outside of the nose.

I have never seen the patient since, and cannot declare positively the result; but I have reason to suppose it is perfect.

CASE 17. *Compound fracture of the ossa nasi. Treatment unsuccessful. Deformity.*

Thomas Burns, of Oppenheim, Fulton County, aged 3 years. The accident occurred from the kick of a horse, producing also a wound on the side of the nose which communicated with the fracture. Dr. Peter Yost, of Oppenheim, was his surgical attendant. The bones still remain considerably displaced, fourteen years after the accident.

CASE 18. *Compound fracture and displacement of the lower ends of ossa nasi to the right side, and backwards, with fracture of the nasal process of the superior maxilla on the left side. Treatment partially successful.*

G. C., aged about 40 years, was kicked by a horse on the left side of his nose, producing insensibility and convulsions, which lasted an hour or more. A clever surgeon attempted to restore the bones by introducing into the nostrils a female catheter. I think the instrument was too large.

When I saw Mr. C., about two hours after the accident, the lower ends of both nasal bones were displaced to the right, and backwards. The nasal process of the superior maxilla on the left side was also broken in. With a straight steel director, and with only moderate force, I lifted the bones into place. The hemorrhage not having ceased, I introduced a lint plug into the bleeding nostril. After two years, I find the form of the nose nearly, but not quite, perfect.

CASE 19.—*Compound fracture of the ossa nasi, complicated with other severe injuries. Death on the twelfth day.*

John Gallaghan, aged 31 years. The frontal, with the superior and inferior maxillary bones, were broken in at the same time. I lifted both the ossa nasi and the fractured os frontis; the restoration of the fragments was complete, but the patient gradually sank, and died on the twelfth day.

CASE 20. *Compound fracture of ossa nasi, complicated with fracture of the cribriform plate of the ethmoid, os frontis, &c. Death after about three months. (See skull in my private collection.)*

H. G., of Brockport, N. Y., aged about 14 years, was kicked by a horse, breaking in the ossa nasi, os frontis, and ethmoid bone. Dr. Thatcher, of Brockport, was called and dressed the wounds. The lad was slightly comatose for a short time. A small portion of brain escaped. Dr. T. lifted the depressed os frontis as well as he was able, but only very partially.

The lad recovered rapidly, and soon returned to school, where his intellect seemed as bright as before. He could also cut and split a cord of wood a day.

About three months after the accident, and about eight days after the discharge of pus had ceased altogether, he began to complain of pain in his head, and in six days died comatose.

The autopsy disclosed a fracture, with depression of the os frontis, ossa nasi, nasal processes of the superior maxilla and ethmoid. The processes of the superior maxilla were driven backwards and laterally into the orbits, and the anterior half of the cribriform lamella, with a portion of the os frontis, were driven quite up into the brain. The septum narium was broken across in several places, and could have been of no use in assisting to restore the ethmoid. I allude to the suggestions occasionally made, that in such cases we ought to seize the septum with a pair of forceps, and attempt, in this way, to bring down the septum and ethmoid together.

Most of the fragments were completely united in their new positions.

CASE 21. *Compound fracture and displacement of ossa nasi. Union without deformity.*

H. W., aged 13 years. William fell while running, and struck upon the corner of a stone step, breaking the lower ends of both ossa nasi, and forcing them directly backwards. I saw him within an hour, and found the nose already much swollen, and bleeding freely with a flesh wound on the right side reaching to the bones. The fracture was not perceptible to the eye, but a crepitus was very manifest.

I immediately lifted the bones with a straight steel director, and without difficulty. Six months after the accident no deformity remained.

CASE 22. *Depression of ossa nasi, and fracture, with depression of nasal process of superior maxilla on the right side. Union, with deformity, &c.*

Thomas Kelly, aged 4 years, was kicked by a horse. Dr. Pratt, of Buffalo, was in attendance within two hours. Nose and face then much swollen. It is probable that, owing to the swelling, which the mother says was already considerable, the fracture was not observed. Dr. P. dressed a lacerated wound upon the upper lip.

One year after the accident, I find both nasal bones depressed through nearly their whole length, and especially in their lower halves. The right nasal process is much depressed, and the right nostril obstructed. The lachrymal canals upon this side are closed.

Ossa Nasi.

No.	Age when it occurred.	Time since it occurred.	Sex.	Character of fracture.	TREATMENT.	RESULT.		
						United or not.		Perfect or imperfect.
1	10 y'rs	1 y'r	M.	Simple	Lifted bones with a steel instrument	United	Slight lateral displacement	Imp.
2	5 "	36 y'rs	"	"	Treated by a surgeon, but treatment unknown	"	Lateral displacement, nasal obstruction, &c.	"
3	11 "	1 w'k	"	"	Lifted bones with a steel instrument	"	Nearly or quite perfect	Per.
4	25 "	2 y'rs	"	"	Treatment unknown	"	Lateral displacement, ulceration, and catarrh	Imp.
5	8 "	15 "	F.	"	Treatment unknown	"	Slight deformity	"
6	3 w'ks	12 "	"	"	No treatment	"	Nose very flat	"
7	45 y'rs	7 d'ys	M.	Compl'd	" "	N. U.	Death on the seventh day	"
8	8 "	10 y'rs	F.	Simple	" "	United	Lateral displacement	"
9	18 "	10 "	M.	"	" "	"	" "	"
10	11 "	13 "	"	"	" "	"	Nose very flat	"
11	9 "	18 "	"	"	" "	"	Lateral displacement	"
12	19 "	9 "	"	"	" "	"	" "	"
13	15 "	15 "	"	"	Treated by a "handy man"	"	Lateral and backward displacement	"
14	7 "	24 "	"	"	No treatment	"	Nose almost flat	"
15	30 "	20 "	"	"	Treated by a "handy man"	"	Lateral displacement	"
16	24 "	3 "	"	Comp.	Lifted bones with a steel instrument	"		Per.
17	3 "	14 "	"	"	By a surgeon; treatment unk'n	"	Bones displaced	Imp.
18	40 "	2 "	"	"	Lifted bones with a steel instrument	"	Nearly perfect	"
19	31 "	12 d'ys	"	Compl'd	Lifted bones		Died on twentieth day	"
20	14 "	3 m'os	"	"		"	Bones remain depressed; died in three months	
21	13 "	6 "	"	Comp.	Lifted bones with a steel instrument	"	No deformity	Per.
22	4 "	1 y'r	"	Compl'd	No treatment	"	Deformity, nasal obstruction, and fistula lachrymalis	Imp.

REMARKS.

"Hippocrate se plaint que les chirurgiens de son temps y vont avec une sorte de timidité blâmable, et les malades eux-mêmes, qui payeraient si cher pour éviter une difformité, ne savent pas se prêter à ce qui est nécessaire. Ces réflexions, pour etre anciennes, n'en sont pas moins applicables à notre temps, et j'ai vu plusieurs fractures du nez dont la réunion vicieuse témoignait à tous les yeux ou de la faute du chirurgien ou de l'impatience des malades."—*Vidal* (*de Cassis*).

I have, at the very outset, deviated widely from the rule which I had laid down for myself, not to report any cases except those which had been treated by regularly qualified surgeons. Of the twenty-two cases of fracture of the ossa nasi, only thirteen were seen by a surgeon in time to afford relief. It seemed to me necessary that we should be instructed how frequently the nature of this accident was overlooked by the friends, and even by the surgeon himself, to the end that we might be thus admonished of the necessity of always instituting in such cases, careful and thorough examinations. In some of the cases reported, where surgeons were called in time, and a deformity remains, it is not improbable that the accident was not recognized. The rapidity with which swelling ensues after severe blows upon the nose, concealing at once the bones, and lifting the skin even above its natural level, explains these mistakes.* The nose, also, is remarkably sensitive, and the patient is often exceedingly reluctant to submit to a thorough examination. It ought, however, not to be forgotten that the omission on the part of the surgeon to do his duty will not always be excused, even though the patient himself has protested against his interference, especially where an organ so prominent, and so important to the harmony of the face, is the subject of his neglect or maladjustment, since the most trivial deviation from its original form or position, even to the extent of one or two lines, becomes a serious deformity.

No one will be led into a false prognosis by a record of such cases so long as we are careful to point them out and separate them in our analysis, from those in which surgeons have been retained. I shall think it necessary, also, to mention several cases of fractures of the *septum nasi*, in which the character of the injury was not at first understood, and no surgical aid was obtained; but in no other bones shall I find such frequent occasions to record similar oversights.

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* "The diagnosis is often very difficult, even where there exists considerable displacement on account of the swelling."—Malgaigne, *op. cit.*, vol. i p. 366.

Of the thirteen cases to which a surgeon was called at first, three died within a short time, and no attempt to restore the ossa nasi was deemed necessary or proper. In two other cases it is probable that the nature of the injury was not recognized. Of the eight remaining cases, and in which attempts at restoration were immediately made by qualified surgeons, five are marked imperfect.

When the ossa nasi are struck with considerable force, from before and from above, a transverse fracture occurs usually within three to six lines of their lower and free margins, and the fragments are simply displaced backwards, or if the blow is received partially upon one side, they are displaced more or less laterally. This is what will happen in a great majority of cases, as I have proven by examinations of the noses of those persons who have been the subjects of this accident, both before and after death, and by repeated experiments upon the recent subject.

These fragments are generally loose and easily pressed back into place by the use of a proper instrument. A silver female catheter, which is so frequently advised by surgeons, may answer well enough in a few instances, but it will much more often fail. The diameter of the meatus at this point, where the instrument must reach in order to make effective pressure upon the ossa nasi, is on the average not more than two lines, and when the membrane which lines it is injured, it becomes quickly swollen, and reduces the breadth of the channel to a line or less. Under these circumstances, any instrument of the size of a female catheter could only be made to reach and press against the nasal process of the superior maxilla, which at this point is too firm and unyielding to allow it to pass without the employment of unwarrantable force. In this way it happens that the operator is occasionally surprised to find how much resistance is opposed to his efforts to lift the bones, and after repeated unsuccessful attempts the case is not unfrequently given over. If, however, he had used a smaller instrument, he would have found almost no resistance whatever. A straight steel director, or sound, or sometimes even a much smaller instrument, if possessing sufficient firmness, is more suitable than the catheter. For the same reason, also, one ought never to wrap the end of the instrument with a piece of cotton cloth as some have, I suspect, without much consideration, recommended.

What I have said of the facility with which these bones may be replaced, when a proper instrument is employed, is true only when the treatment is adopted immediately, or at most within a few days after the accident. It is remarkable how rapidly these bones unite. In Case 3, the union was quite firm on the seventh day, so that I was obliged to use great force to replace the fragments; indeed, the fracture was reproduced. Hippocrates thought the union was generally complete in six days. Boyer, Malgaigne, and others have noticed the fact that these fractures were repaired with great rapidity. Nor has Malgaigne, whose observations are always very accurate, overlooked the fact, also, that their repair is effected without the interposition of provisional callus, but as it were "*par premiere intention.*" My own observation confirms this statement. Among all the specimens which I have seen in the various college and private collections illustrating fractures of the ossa nasi, and amounting in all to over forty, in no instance has there been detected, after a careful examination, the slightest trace of provisional callus.

I am not certain that it will always be found so easy to retain these loose fragments in place, as it is to replace them. The very swelling which takes place so promptly under the skin tends to depress the fragments, unsupported as they are by any counter force; a tendency which, possibly, is in some instances increased by attempts on the part of the patient to clear his nostrils by snuffing and hawking. I have, in one instance, Case 16, noticed very plainly a motion in the fragments when such efforts were made. How we are to remedy this I am not prepared to say. None of the plans which I have seen suggested possess, in my estimation, much practical value. Few patients will consent to the introduction of pledgets of lint, or of stuffed bags, or, indeed, of anything else, sufficiently far up into the nostril to answer any useful purpose. The membrane is too sensitive and too intolerant of irritants to enable us to have recourse generally to such methods. Then, too, it would require on the part of the surgeon more than ordinary tact to accomplish so nice and delicate an adjustment of the supports from below as these cases demand, where the slightest excess of pressure or the least fault in the position of the compress must defeat the purpose of the operator.

A more considerable force than that which I have first supposed, will break, generally, the ossa nasi transversely and a little above their middle, while, at the same time, the nasal processes of the superior maxillary bones may suffer slightly.

With neither of these accidents is the cribriform plate of the ethmoid likely to be broken or disturbed. Indeed, in numerous experiments made upon the recent subject, and in which the force of the blow was directed backwards and upwards, breaking and comminuting the nasal bones above and below their middle, with, also, the nasal processes of the superior maxillary bones, and the septum nasi, the cribriform plate of the ethmoid was, without an exception, uninjured. The exceeding tenuity and flexibility of the septum nasi at certain points, prevents effectually the concussion from being communicated through it to the base of the brain. If, therefore, after these accidents, cerebral symptoms are occasionally present, as in Cases 16 and 18, they must be due rather to the concussive effects of the blow upon the very summit of the nasal bones, where they rest immediately upon the nasal spine of the os frontis, or to some direct impression upon the skull itself.

The amount of force requisite to break in the nasal bones, at their upper third, is very great; no less, indeed, than is requisite to fracture the os frontis. If they do finally yield at this point, then no doubt the base of the skull must inevitably yield also. Nor do I think patients could often be expected to recover from an accident so severe. To this class of fractures belongs Case 20, in which not only the whole of the nasal bones were sent in—the nasal spine being broken at its base—but also the os frontis was depressed, the nasal processes of the upper maxillary bones broken and greatly displaced, and the anterior half of the cribriform plate of the ethmoid forced up into the base of the brain. If it is meant that in *these* cases the patient is in danger from injury done to the base of the skull, through the fracture and depression of the ossa nasi, we can appreciate the value of the opinion; but we do not understand how this danger can exist when the nasal spine of the os frontis is not broken, and the upper ends of the nasal bones are not displaced backwards. But, admitting that it were possible in this way to force up the base of the skull, it does not seem to me that we ought to attach any value to the advice occasionally given, to attempt to restore the broken ethmoid by seizing upon the septum and pulling downwards. A force sufficient to break the base of the skull, never fails to comminute and detach almost completely the septum nasi. We are to proceed in such a case as we would in a case of broken skull. We must lay open the skin freely, and with appropriate instruments seek to elevate and remove, if necessary, the fragments.

Indeed, after such accidents, we shall generally see plainly enough that death is inevitable, and that our services will be of no value.

Occasionally, I have observed, the bones are neither broken at their lower ends, nor through their central diameters, but only at their lateral serrated or imbricated margins. This is rather a displacement, or a dislocation, than a fracture. It is more likely to happen, I think, in childhood than in middle or old age (Case 22), and sometimes the lower ends only *bend* backwards or sideways. If there is more complete displacement, the upper ends are not usually forced backwards, but rather a very little forwards from their articulations with the os frontis, and the bones then swing, as it were, upon the lower ends of the nasal spine, as upon a pivot. In this condition, they are very firmly locked in, and it requires considerable force, applied under their lower extremities, to restore them to place. In Case 1, the bones were thus forced sideways, and without a fracture. In Cases 10 and 22, they are displaced backwards; and probably, also, the same thing has happened in several of the ancient cases, occurring in infancy or childhood, and the history of which is incomplete.

In children, also, the nasal bones may be spread and flattened, the lateral margins not being depressed or displaced, but only the mesial line or arch forced back, so as to press aside the processes of the superior maxilla, which deformity may become permanent, as in Cases 6 and 14.

The unusual morbid phenomena which followed in Case 4, such as catarrh, ulceration, &c., ought to be regarded as accidents due to the state of the general system, and as having no connection with the fracture, except as this injury served to awaken certain vicious propensities. Yet it is true that Mr. Benjamin Bell and others have spoken of "tedious ulcers," "polypi," impeded respiration, and impairment of the sense of smell and of speech, as circumstances apt to result from these injuries, and it is not improbable that such consequences have often followed.

CHAPTER II.

SEPTUM NARIUM.

CASE 1. *Lateral displacement of cartilaginous portion. No surgeon employed. Deformity remains. Nasal catarrh.*

W. H. W., of Cherry Valley, aged 15 years. Struck accidentally by a brickbat. The nose became immediately much swollen, and no surgeon was called. Eight years after the accident, the septum remained displaced laterally and to the left side, producing a slight lateral displacement of the end of the nose. He cannot blow freely through the left nostril, and he has had a catarrhal discharge from the same nostril from that time to the present.

CASE 2. *Cartilaginous portion broken down. A surgeon employed. Great deformity.*

Ledyard Littlefield, aged 19 years, was struck on the top of his nose by a ball. It became immediately much swollen. A surgeon was called, who said that no serious accident had occurred, but that when the swelling should subside it would be all right.

The nose is now, thirty-three years after the accident, almost perfectly flat, the cartilaginous portion of the septum being pressed entirely down and to one side.

CASE 3. *Cartilaginous portion broken down. A surgeon employed. Marked deformity.*

John Baptiste, aged 26 years, a Mexican by birth. The nose was broken by a blow. Dr. Beecher, of New Haven, Connecticut, was called. Four years after the accident, the septum remained displaced, and the nose much flattened.

CASE 4. *Fracture of the cartilaginous portion of the septum nasi. Slight deformity remaining.*

James Murphy, aged 25 years. The accident occurred three years ago, and the nose is slightly turned to one side by displacement of the septum. No surgeon was employed.

Case 5. *Fracture of septum nasi. Deformity. Curious effect upon right side of face.*

A. A. C., aged 16 years, fell on his face upon the ice. The nose bled profusely. Employed no surgeon.

Seven years after the accident he called upon me, supposing that he had a polypus nasi. The septum is displaced to the right side, so as to almost completely close this nostril. This obstruction has existed from the time of the receipt of the injury. In very cold weather, when the vessels of the membrane are constringed, the passage is somewhat more free. The left nostril is proportionably wide.

During the last four or five years, the right side of his face has been subject to profuse perspirations. It is almost constant in summer, and frequent in winter. The line of division between the perspiring and non-perspiring portions of the face passes perpendicularly from the top of the centre of the forehead, along the ridge of the nose, and down to the centre of the chin. The phenomenon is due, perhaps, to an increased vascularity in the right side of the face; possibly to some peculiarity in the condition of the nervous trunks, occasioned by the nasal obstruction.

Case 6. *Fracture of the cartilaginous portion of the septum nasi. No surgeon. Permanent deformity.*

Shannon, of Buffalo, aged nine years, fell on his face while runnine. No surgeon was called. The cartilaginous portion of the septum is broken at its junction with the perpendicular plate, and from this point downwards it inclines to one side, carrying with it the whole of the lower portion of the nose. Examined by myself two years after the accident.

Case 7. *Fracture of the cartilaginous portion of the septum. Deformity. Successful operation for its relief.*

H—— C——, of Chicago, aged 18 years. This young man fell, while walking in his sleep, from a two-story window, striking upon his face. A surgeon was called, but he did not discover the nature of the injury to his nose.

One year after the accident he called upon me for relief. The cartilaginous portion of the septum was broken just at the ends of the nasal bones, and forced backwards about three lines, producing a striking depression at this point of the ridge of the nose, while at the same time the end of the nose was thrown up. The deformity was very unseemly, and annoying both to himself and to his friends, who at first could scarcely recognize him. From a handsome Grecian, his nose had been converted into an ugly "pug."

Without promising much, I consented to operate.

Operation.—I introduced a narrow, sharp-pointed bistoury through the skin of the nose on the right side, and resting its edge upon the ridge at the junction of the cartilage with the ossa nasi, I cut the cartilaginous septum perpendicularly backwards about three lines, and then making a gradual curve with my knife, I cut downwards about eight lines towards the end of the nose. The intercepted portion of cartilage could now be easily lifted with a probe, and the line of the ridge of the nose completely restored. It was at once apparent, also, that lifting the cartilage would depress the tip of the nose, and restore its symmetry.

To retain the cartilage in place, I constructed a gutta percha splint, of the length and shape of the nose, but so formed along its middle as that it would not press upon the cartilage which I had lifted, resting well upon the ossa nasi, but not touching the ridge from the lower ends of these bones to the tip of the nose, at which latter point it again received support. I now passed a needle, armed with a stout ligature, through the upper end of the uplifted cartilage, transfixing, of course, the skin on both sides of the nose, and this I tied firmly over the splint. This accomplished, the important object of pressing backwards and downwards the tip of the nose, and thus tilting up the upper part of the ridge and septum, and of more effectually securing the cartilage in place by lifting it directly with the ligature. On the second day the ligature was removed, but the splint was continued two weeks, during most of which time a band was kept drawn across the lower end of the splint, and tied behind the neck.

To prevent the cartilage from falling back when final cicatrization occurred, I pressed the sides of the splint firmly towards each other, just below the incision, so as to press as much as possible the walls of the nares into the fissure in the septum, made by lifting it up.

The result is a complete and perfect restoration of the nose to its original form.

Septum Narium.

No.	Age when it occurred.	Time since it occurred.	Sex.	TREATMENT.	RESULT.		
					United or not.		Perfect or imperfect.
1	15 y'rs	8 y'rs	M.	Surgeon employed, but no treatment	United	Lateral displacement and catarrh	Imp.
2	19 "	30 "	"	Surgeon employed, but no treatment	"	Backward and lateral displacement. Nose flattened	"
3	26 "	4 "	"	Surgeon employed, but no treatment	"	Backward and lateral displacement. Nose flattened	"
4	22 "	3 "	"	No surgeon employed, and no treatment	"	Lateral displacement, and nose turned to one side.	"
5	16 "	7 "	"	No surgeon employed, and no treatment	"	Lateral displacement, and obstruction of nostril. One-half of face subject to abnormal sweats	"
6	9 "	2 "	"	No surgeon employed, and no treatment	"	Lateral displacement of septum and nose	"
7	18 "	1 "	"	Surgeon employed, but no treatment	"	End of nose tilted upwards. Successful operation after one year	"

REMARKS.

Of the "results of treatment" in cases of fractures or displacements of the septum narium, we have no facts or conclusions to record. In three of the seven cases no surgeon was employed, and in these, also, no surgical treatment was adopted, and it is quite probable that in only a small proportion of all the cases was the nature of the accident recognized. Such at least has been generally the statement of the patients themselves. The same causes will explain this which have been invoked to explain similar oversights in cases of broken ossa nasi. To which we may add, as an additional reason why it may be overlooked, the frequency of lateral distortions or deviations in the natural development of this septum.

The cartilaginous portion of the septum is that which is most frequently displaced by violence, and then it is usually at the point of its articulation with the bony septum. Next in point of frequency the perpendicular nasal plate is broken, and especially where it approaches the vomer. We omit in this enumeration, of course, those cases where the nasal bones themselves are broken down, in most or all of which the perpendicular plate is more or less fractured and displaced. We cannot say how often the vomer is broken, since it is beyond our observation, except in autopsies. It is probable, however, that the force of the concussion rarely reaches it, the cartilage or the perpendicular plate giving way first and easily.

Where the deviation is only lateral, the results are less serious, yet sufficiently so in a few instances to demand our attention. Lateral obliquity of the lower portion of the nose follows generally, but not uniformly, a lateral displacement of the cartilage, and when it does exist it is not always proportioned to the amount of displacement existing in the septum, so that the septum is then made to project obliquely across the nasal passage, causing often a serious obstruction and permanent inconvenience. In Case 1, a permanent catarrh accompanied this obstruction, and in Case 5, a curious sweating phenomenon, which is particularly detailed in the report. Neither of these circumstances ought, however, to be regarded as probable results, but only as rare instances of singular morbid events. Yet a catarrhal affection in the obstructed nostril is not very infrequent. It was observed not only in Case 1 of this chapter, but also in Case 4 of the chapter treating of broken ossa nasi. To what it may be due I shall not attempt to explain.

A depression of the cartilage forming a portion of the ridge of the nose is necessarily accompanied with a corresponding degree of lateral displacement, with or without fracture of its perpendicular portion, and produces, therefore, not only great deformity, sometimes a complete flattening of the end of the nose, but, also, in some instances, complete obstruction of the nostrils.

We conclude, from the limited experience which we are able to present, that fractures and displacements of the septum narium are generally followed by permanent deformity, and occasionally with still more serious results. We suggest, therefore, a more careful examination in recent injuries, with a view to the ascertainment of its lesions, and it would be well, certainly, if we could devise some reliable mode of treatment.

With no actual experimental knowledge upon this subject, we are left to the suggestions of others, and to our own speculations, neither of which are very satisfactory. It is doubtful whether a partition so thin and unsupported can ever be well adjusted and supported by artificial means. We possess, however, one advantage in the treatment of this accident which we do not in the treatment of broken ossa nasi, viz: facility of observation and of approach, and if we can do little with plugs and supports in the one case, we may possibly do more in the other. Nothing seems more rational, then, than to plug carefully and equally each nostril, with pledgets of lint, while we cover the outside of the nose completely with a nicely moulded gutta percha splint or case, which ought to be made to press snugly upon the sides, and permitting these to remain for several weeks, or until the cure is completed. The *papier mache* of Dzondi, employed by him in cases of broken ossa nasi, would be equally applicable here; but the gutta percha, as being more plastic, and hardening more quickly, ought to be preferred.

Attempts to remedy the deformities of the nose at a later period, belong to the department of anaplastic surgery, and the modes of procedure must be varied according to the circumstances of the case. One instance of this kind I have related in Case 7, which was highly satisfactory, and which may serve as an example of what we may sometimes accomplish.*

CHAPTER III.

OSSA MAXILLARIA SUPERIORA.

CASE 1. *A compound fracture of the nasal process of the superior maxilla, complicated with fracture of the ossa nasi.*

G. C. (See Case 18 of Fractures of the Ossa Nasi.)

CASE 2. *Fracture of both upper maxillary bones, with partial separation at their articulations, and depression of the right malar bone. Recovery with permanent depression of the malar bone.*

Harvey, of Fond du Lac, aged twenty years. Harvey was thrown backwards from a loaded cart, one wheel of the cart passing over his face. He was taken up unconscious. I saw him next day. Consciousness had then returned.

The right malar bone was broken from its articulations, and forced down upon the antrum about three lines. Both superior maxillæ were loosened from their articulations, and could be moved laterally, the motion producing a slight grating sound. The same motion and grating occurred whenever he attempted to swallow. No effort was made to elevate the malar bones, nor did I find any means necessary to retain the maxillary bones in place, the amount of displacement being very inconsiderable, and never sufficient to be observed by the eye. Cool lotions were applied constantly to the face, and the patient was sustained by a liquid diet. On the ninth day all motion of the fragments had ceased, and on the twenty-seventh day the patient was completely recovered, with only the depression of the malar bone remaining.

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* See M. Dieffenbach's operation.—*Gazette des Hôpitaux*, 22 Fev., 1842. A Paris.

CASE 3. *Compound fracture of right inferior maxilla. Removal of floor of antrum. Recovery with slight depression of malar bone.*

M. P., of Colesville, Wyoming County, aged about thirty-four years, was thrown from a height, striking upon his face, and forcing the right malar bone down upon the antrum of the superior maxilla. Dr. L. Potter, of Varysburg, and myself were called.

The deformity produced by the sinking of the malar bone was very striking, and the patient, as well as ourselves, was very anxious to have it remedied if possible. We found some of the teeth upon the side of the fracture loose, and we determined to extract them and press up the bone with an instrument introduced through the empty sockets. The first attempt to extract a molar tooth, however, brought down several teeth, and the whole floor of the antrum. The detachment of this fragment was also now so complete that we believed it necessary to remove it entirely, a labor which was accomplished with infinite difficulty, and with no little hazard to the patient, as dissection had to be extended very far back into the throat, and in the end it was not effected without bringing out, attached to the fragment of maxillary bone, a considerable portion of the pterygoid process of the os palati.

The time occupied in this operation was at least one hour, during which we were every moment in the most painful apprehensions lest we should reach and wound the internal carotid, which lay in such close juxtaposition to our knife that we could distinctly feel its pulsation. After its removal, the hemorrhage was for an hour or more quite profuse, and could only be restrained by sponge compresses pressed firmly back into the mouth and antrum.

When the hemorrhage was sufficiently controlled, we proceeded to examine the antrum, the floor of which being removed entire, permitted the finger to enter freely. The restoration of the malar bone was now accomplished without much difficulty, and with only moderate force.

Two years after the accident, the face presented, externally, no traces of the original injury. The malar bone seemed to be as prominent as upon the opposite side, and there was no perceptible falling in where the teeth and alveoli were removed. During several months after the removal of the bone, the antrum continued to discharge pus, but at length a semi-cartilaginous production closed in the cavity below, entirely reconstructing its floor, and the discharge ceased. Since then he has experienced no further inconvenience.

CASE 4. *Fracture of both upper maxillary bones, complicated with fractures of the nasal bones, and of the lower maxilla. Death on the twelfth day.*

(See Case 19 of Fractures of the Ossa Nasi.)

CASE 5. *Fracture of left nasal process, compound and complicated with fracture of the os frontis, nasal bones, &c. Death in three months.*

(See Case 20 of Fractures of the Ossa Nasi.)

The nasal process upon the left side was broken just above the root of the cuspid tooth, and its upper end was inclined inwards towards the nasal passage and backwards, until it was completely buried. In this situation it had become firmly united to the bony and soft tissues into which it was brought in contact.

CASE 6. *Fracture of the right nasal process, complicated with fracture of the ossa nasi et cart. Deformity remains.*

(See Case 22 of Fractures of the Ossa Nasi.)

Ossa Maxillaria Superiora.

No.	Age when it occurred.	Time since it occurred.	Sex.	Character of fracture.	TREATMENT.	RESULT.			
						United or not.	When united.		Perfect or imperfect.
1	40 y's	2 y's	M.	Comp. compl'd	Lifted with a steel instrument	United		Nearly perfect	Imp.
2	20 "	4 w's	"	Comp. compl'd	Cool lotions and rest	"	9 d's	Slight depression of the malar bone	"
3	34 "	2 y's	"	Comp. compl'd	Elevation of malar bone through an opening made at the base of the antrum	"		No deformity	Per.
4	31 "	12 d's	"	Comp. compl'd	No treatment; but rest, &c.	"		Death on twelfth day	Imp.
5	14 "	3 m's	"	Comp. compl'd	No treatment; but rest	"		Death in three months	"
6	4 "	1 y'r	"	Comp. compl'd	No treatment; but rest, &c.	"		United with depression	"

REMARKS.

"Fort rares et à peine étudiées."

These fractures assume so great a variety in respect of form, situation, and complications, that no general prognosis can be established.

When the harmonies of the upper maxillary bones are only slightly disturbed, as in Case 2, nothing but a contentive treatment is necessary. If the alveoli are extensively detached, they may be secured by dentists' gold or silver thread, but it is not always that a reunion of the fragments will occur. Ledran reports a successful case of this kind. See *Observations Chirurgicales*, tom. i. obs. 3. And Malgaigne remarks: "In all complicated fractures of the upper jaw, there is one principle which surgeons cannot too much study, namely, that all fragments, however slightly adherent they may be, ought to be most carefully preserved, and they will be found to unite with wonderful ease. This remark had already been made by Saviard. Larrey insists strongly upon it, and we have seen that M. Baudens, so great an advocate for the removal of loose fragments, has declared for these fractures a special exemption." (*Op. cit.*, vol. i. p. 376. Paris ed.)

Fractures and depressions of the nasal processes have been mentioned in connection with fractures of the ossa nasi. Such fractures occurred in Cases 1, 4, 5, and 6. It is seldom, unless they happen to be so exposed that they may be seized upon with forceps, that anything can be done for their relief.

I wish to suggest an expedient for lifting the malar bone when it has been thrust down upon the antrum of the upper maxillary, which may in certain cases be substituted for the mode which has been heretofore generally adopted.

In many instances, no difficulty will be experienced in resorting to the usual method. The recent loss of one or more teeth opposite the floor of the broken antrum, or the complete displacement of a tooth by the accident itself, will give an opportunity for the perforation of the antrum through the open socket, and for the introduction of a suitable instrument for lifting the depressed bone. Unless, however, the opening is quite large, the instrument employed must be so small, such as a straight steel sound or a female catheter, as to expose the parts against which its end is made to press, to some risk of being broken and penetrated. It is even possible in this way to penetrate the socket of the eye, and thus inflict serious injury upon the eye itself. Yet, with some care, such accidents may be avoided, and it is probable that, in the cases supposed, where the sockets of the teeth opposite the base of the antrum are open, this method will continue to have the preference.

But if the teeth remain firm in their places, or if they have been some time removed, and the sockets are filled up, and we wish to enter the antrum at its base, we must either drill through its anterior wall above the roots of the teeth, or we must proceed to extract a tooth. The first method gives an inconvenient opening, and one through which it will be necessary to use a curved instrument; but yet it is a method far less objectionable than the extraction of a tooth which is firm, or which is even tolerably firm in its socket, and which may require the forceps for its removal. The objections to this latter procedure were suggested by our tedious and painful operation in Case 3. The first attempt to extract a tooth brought down the whole floor of the antrum, with all its corresponding teeth and the pterygoid process. The tooth was already loose, and we thought it might be easily taken out, but it had not occurred to us that it was loosened by the comminuted condition of the walls of the antrum, and of the alveoli. Nor do we now very well see how this condition should not always coexist with a depression of the malar bone, and why, therefore, an attempt to extract a tooth should not always, after these accidents, expose to the same hazards. Certainly it is no trifling matter to pull away all of a man's upper teeth upon one side, and to open freely into a broad cavity which might never close again, and which, in this event, must always serve as a place of lodgment for particles of food, and for foul secretions, to say nothing of the external deformity which it is likely to produce, and of the severity and even danger of the operation. Be assured that neither myself nor my excellent counsel and co-operator, Dr. Potter, will ever again attempt a similar feat.

I wish then to suggest a procedure, the value of which I have not yet had an opportunity to determine by any experiment upon the living subject, but which I have carefully and frequently tested upon the dead. It is only that we should employ for the purpose of lifting the malar bone, a screw levator, an instrument which I find already constructed, in a case of trephining instruments made for me by Mr. Luer, of Paris, and which I have often used and constantly recommended to my pupils, in certain cases of fractures of the skull. The instrument ought to be made of the best steel, and with a broad, sharp-cutting thread. A slight incision being made through the skin, and down to the centre of the malar bone, the elevator is then screwed firmly into its structure, and now its elevation and adjustment may be accomplished with the greatest ease. In case the surgeon is not provided with this excellent instrument, a joiner's gimlet might answer tolerably well.

CHAPTER IV.

MAXILLA INFERIOR.

CASE 1. *Comminuted fracture. Union without deformity.*

Andrew Vandwie, aged twenty-four years. Fracture produced by a blow from a club. On the right side the jaw was broken just in front of the angle, and one molar tooth partially dislocated. On the left it was broken near the anterior mental foramen, and the corresponding tooth was partially dislocated. Both fractures were oblique.

I was called three days after the accident. The face was then much swollen. Assisted by Dr. John Trowbridge, I applied a felt splint, which was moulded to the form of the chin and face. I had previously extracted the loosened tooth, situated in the line of the most anterior fracture, chiefly with a view of closing the jaws completely, and of permitting him to imbibe his food through the opening thus made. I also replaced the loosened molar. No interdental splints were employed. On the sixth day we found that the sides of the felt splint being flexible, allowed, when the retentive bandages were applied, too much lateral pressure. The posterior fragments were, in consequence, made to fall inwards. We therefore substituted a well-moulded and well-padded copper splint, constructed with broad and slightly expanded wings. This apparatus was continued to the close of the treatment.

On the thirty-sixth day after the accident, the dressings were finally removed, and union was complete. The form of the jaw and the line of the teeth were perfect. No provisional callus could be felt. During a part of the time the patient had applied fomentations of hops and vinegar, and without my knowledge. In consequence of this the acetate of copper had produced several slight ulcerations upon the skin, which soon healed when the splint was taken off.

About a week later I found the molar tooth, which I had replaced, loose and troublesome. I therefore removed it altogether. The cure was complete.

CASE 2. *Comminuted fracture. Union delayed. Result perfect.*

N—— B——, aged fifteen years, was struck violently with the heel of a man's boot, while lying upon the floor and upon his back. Fracture near the anterior mental foramen upon both sides, oblique. Suitable dressings were applied by a surgeon in Oswego, but considerable difficulty was experienced in retaining the fragments in place.

About two months after the accident he consulted me, the bones not having yet completely united. The dressings had been removed. I advised nothing but careful use of the jaw, and in a short time the union was complete and perfect.

CASE 3. *Compound comminuted fracture. Union without deformity.*

Jenks, a canal boatman, aged about twenty-five years, was struck by a stone thrown with great violence, breaking the inferior maxilla, on the left side, near the anterior mental foramen. A portion of the alveolar margin was also broken off, containing the sockets of three teeth.

Dr. Maxwell, of Lockport, dressed the fracture. Five days after the accident, the patient called on me, having continued upon his boat until he reached Buffalo. The face was then much swollen, the anterior fragment slightly displaced, and the portion of the alveoli, which had been secured in place by wires ingeniously belted upon the teeth, was quite loose. I removed the teeth and alveoli, placed cork splints between the molars, and applied a moulded pasteboard splint to the chin, securing it in place with a four-tailed bandage.

I found that, with this apparatus, it was impossible to prevent the anterior fragment from being slightly displaced backwards; nor could I draw the bandage so tight that, in the act of deglutition, a motion and grating were not perceptible between the fragments.

The union was completed in a few weeks. I think in about three, without any perceptible deformity.

Case 4. *Simple fracture. Union without deformity.*

—— of Colesville, aged about forty years. Dr. Parker, of Wyoming County, was in attendance. On the third day, Dr. Parker requested me to see the case with him, as he had some difficulty in retaining the fragments in place.

We found that, during the absence of Dr. Parker, he had carved from a block of wood, a splint which fitted accurately the chin and face, and served the purpose admirably for which it was intended. The fragments were well in place, and without interdental splints he was able to receive nourishment between his teeth. The dressings were permitted to remain. Four years after, I learn that the jaw is perfect.

Case 5. *Compound comminuted fracture. Union without deformity.*

C—— B——, of Little Falls, aged fifty-five years. Fracture through the shaft caused by the kick of a horse. A small fragment of the alveoli with one molar tooth was broken off, and removed by the surgeon at the first dressing.

Dr. Green, of Little Falls, dressed the fracture with a four-tailed bandage, pasteboard, &c., without interdental splints.

Seventeen days after the accident, I re-dressed the fracture at my college clinic. I found the fragments nicely in apposition, and not movable.

I applied an apparatus made entirely of leather, and of my own construction. The result I do not know positively, but as it was in place and united on the seventeenth day, I think I may assume that it is perfect.

Case 6. *Compound comminuted fracture. Slight permanent deformity.*

John Keef, an Irish laborer, aged seventeen years. John was thrown from a wagon breaking his leg at the same time. The inferior maxilla was broken on both sides through the shaft, and, also, exactly in the centre, vertically, between the central incisors.

I dressed the jaw with a four-tailed bandage, but found great difficulty in bringing up the left fragment to a line with the right, and therefore closed the jaws, and, finding that the left side fell three lines below the right, I placed a pine-wood wedge between the teeth on the right side, and drew the jaw up firmly. It now lacked only about half a line of being in place.

I had not thereafter much difficulty in maintaining quiet and apposition of the fragments, and I supposed, from repeated examinations, that they were in exact line, until four weeks after the fracture had occurred, when I discovered that the central fragments were lifted about two lines above the lateral, and, also, slightly carried back; and although union had not taken place, yet they could not be replaced by any moderate force. The bones united with this slight deformity. Four days later no motion was perceptible, and the displacement seemed to be rather less From this time the dressings were discontinued.

CASE 7. *Compound comminuted fracture. Union without deformity.*

Augustus Cotesworth, aged eleven years, was kicked by a horse, producing a fracture on the left side of the jaw, between the first and second incisors, with an external wound communicating with the fracture. There was also a fragment of nearly two inches in length broken off from its lower margin. Four teeth were knocked entirely out from the upper jaw, and the face was badly cut and bruised. All the teeth in the lower jaw remained firm. The fracture was oblique. I removed immediately the loose fragments of bone. Between the teeth I placed splints of gutta percha, covered with cotton cloth. A firm and well padded splint of gutta percha was also applied to the under side of the chin, with broad wings, penetrated with fenestra, through which bands were passed, to be subsequently fastened over the top of the head. Care was taken that the sides of the splint should not press too snugly against the sides of the face and jaw. Corresponding to the wound in the face, an opening was made in the splint, through which the wound could be dressed, and the matter be permitted to escape.

Very little difficulty was experienced in the treatment of this case. The result is a cure without any deformity except what results from the scar on the face.

CASE 8. *Compound comminuted fracture, with fracture of the superior maxilla, ossa nasi, &c. Death on the twelfth day.*

John Gallaghan, an Irish laborer, aged thirty-one years, admitted to the hospital, October 3, 1851, with a fracture of the inferior maxilla, on the right side, near the centre of the shaft. Fracture compound, oblique, and comminuted. The ossa nasi, and ossa maxillaria superiora were also broken and displaced. Patient partially conscious.

I made only slight attempts to adjust the fragments, as death seemed inevitable. He died comatose, on the twelfth day. (See Case 19 of Fracture of the Ossa Nasi.)

CASE 9. *Simple fracture. Result not perfect.*

R—— B——, aged thirty-nine years. Fractured obliquely across the right angle of the jaw. Dr. Billings, of Hamilton, C. W., dressed the fracture, and, as far as I can judge, skilfully, with a four-tailed bandage. The bandage was continued three weeks. On the sixth week, Dr. B. extracted the last molar upon that side, finding that it interfered with the closure of his jaws.

Seven weeks after the accident, the patient called upon me. The fragments were united, but there was a large amount of callus upon the outside, and the posterior fragment was lifted up, so that the teeth were not on a line. The jaw does not close perfectly.

CASE 10. *Comminuted fracture. Union delayed.*

Andrew Mahoney, aged twenty-six years, had his jaw broken by a blow with a club. On the right side, the fracture is between the two last molars. On the left side, it is broken just in front of the first molar. One of the molars was knocked completely out. He called on me seventeen days after the accident, and at this time no dressings had been applied.

The right side of the face continued much swollen. The fragments were loose and much displaced. On the left side, the anterior extremity of the posterior fragment fell inwards towards the mouth, and the whole anterior or central fragment was depressed and drawn backwards.

Assisted by Dr. Boardman, I applied a gutta percha splint to the outside of the jaw and face, and moulded splints of the same material between the teeth. The whole was secured by bandages very carefully and accurately. About ten days after this dressing was applied, he disappeared, and I have not seen him since. In the mean time, however, the fragments were kept tolerably well in place, but as the bones had not united at the end of four weeks, I suspect it has resulted in deformity.

CASE 11. *Simple oblique fracture. Result perfect.*

I. W. S., of Darien City, aged twenty-six years, was struck by a club in the hands of some unknown person, while walking at night in one of the streets of Buffalo. He was for a moment bewildered, but never completely unconscious. The next morning he called upon me. The inferior maxilla was broken obliquely; on the right side, just anterior to the last molar. The anterior fragment was displaced downwards and backwards.

Assisted by Drs. Nicholls and Pupikofer, I applied a gutta percha splint to the outside of the chin and face, and between the teeth I placed gutta percha wedges, moulded to the teeth and gums. The fragments now seemed to be in place, and well supported. S. returned home the same day, and soon after placed himself under the care of Dr. Ganson, of Batavia, who removed the gutta percha and substituted other dressings. Four months after the accident, I found the fragments perfectly in place, and no remaining deformity.

CASE 12. *Simple fracture. Result perfect.*

Joseph McEllicott, aged twenty-two years. Fracture near the angle of the inferior maxilla, on the right side.

It was treated by Dr. Johnson, of Cattaraugus. Bony union occurred in three weeks from the time of the fracture, and without deformity. This case was examined by myself soon after the cure was completed.

CASE 13. *Fracture and union without deformity.*

Albin Vanderheyden, aged thirty-seven years. The fracture occurred through the angle, on the right side. I examined the bone twenty-five years after the accident, and no deformity or imperfection could be discovered.

CASE 14. *Compound comminuted fracture, through the symphysis. Union with slight deformity.*

Norman Mason, aged twenty-five years. Broken by the kick of a horse. Left lateral incisor completely displaced, and a large piece of the alveoli detached. Dr. S. G. Ellis, of Gowanda, N. Y., dressed the fracture, securing the loosened fragment by the mainspring of a watch, made fast to the teeth by a silver wire, and closing the mouth completely, without any interdental splint. Upon the outside he placed a pasteboard splint and bandages. On the fourth week a fragment exfoliated, and came out under the chin. The union was delayed some six or eight weeks.

I examined the jaw ten years after it was broken, and found the line of a vertical fracture exactly through the symphysis mentis. The left half of the chin was slightly elevated, and the whole of that side of the shaft was smaller than the right. He cannot close his teeth perfectly, yet he can close them sufficiently for the purmonths. It is possible, however, that a small fragment remains loose at the point of fracture, and that this has, in some measure, caused the delay and swelling.

At my instance, he soon after placed himself under the care of Dr. Rano, of Pembroke, N. Y. Dr. R. extracted the last molar, and evacuated considerable pus. He has also taken measures at once to improve his general health. At the end of seventy days from the time of fracture, Dr. Rano informs me that it has not united.

Maxilla Inferior.

No.	Age when it occurred.	Time since it occurred.	Sex.	Simple, compound, comminuted, or complicated.	Transverse or oblique.	Point of fracture.	TREATMENT.	RESULT.			
								United or not.	When united.		Perfect or imperfect.
1	24 y'rs	3 y'rs	M.	Commin.	Oblique	Angle and shaft	Copper splints to outside. No interdental splints	United	5 w'ks	No deformity	Per.
2	15 "	6 "	"	"	"	Shaft	Unknown	"	3 mo's	No deformity	"
3	25 "	4 w'ks	"	Comp. commin.	"	"	Pasteboard splint to outside, and interdental splints of cork	"	3 wk's	No deformity	"
4	40 "	4 y'rs	"	Simple	"	"	Carved wooden splint. No interdental splints	"		No deformity	"
5	55 "	17 d'ys	"	Comp. commin.	"	"	Pasteboard splint, and subsequently a leather apparatus. No interdental splints	"	17 d'ys	No deformity	"
6	17 "	1 y'r	"	Comp. commin.	Oblique and trans.	Shaft and symph.	Four-tailed bandage, and interdental splints of pine wood	"	6 w'ks	Slight deformity	Imp.
7	11 "	4 y'rs	"	Comp. commin.	Oblique and trans.	Shaft	Gutta percha splint on the outside, and the same as in interdental splint	"		No deformity	Per.
8		12 d'ys	"	Comp. commin. compl'd.	Oblique	"	No treatment	Non-united		Died on the 12th day	Imp.
9	39 "	7 w'ks	"	Simple	"	Angle	Four-tailed bandage	United		Excess of callus and slight deformity.	"
10	26 "	4 "	"	Commin.	"	Angle and shaft	No treatment for 17 days. After this a gutta percha splint outside, and the same between the teeth	Delayed		Probably deformed	"
11	26 "	4 mo's	"	Simple	"	Shaft	For a few days with gutta percha splints within and without	United		No deformity	Per.
12	22 "	3 w'ks	"	"		Angle	Treatment unknown	"	3 w'ks	No deformity	"
13	12 "	25 y'rs	"			"	Treatment unknown	"		No deformity	"
14	25 "	10 "	"	Comp. commin.	Trans.	Symph.	Pasteboard splint on outside. No interdental splints	"	7 w'ks	Slight deformity	Imp.
15	4 "		"	Commin.	Oblique	Shaft	Gutta percha splints within and without	"	6 w'ks	No deformity	Per.
16	43 "		"	Simple	"	"	No surgeon, and no treatment under 14 days				
17	23 "		"	Commin.	"	Shaft and symph.	Gutta percha splint on outside. No interdental splint	"	3 w'ks	Slight deformity	Imp.
18	25 "	2 mo's	"	Simple	"	Angle	No treatment under 70 days	Non-united	70 d'ys	Lateral displacement, ulcers, &c.	"

REMARKS.

“La reduction assez facile à opérer est souvent difficile à maintenir.”—*Vidal (de Cassis).*

It is difficult, sometimes, and especially where the fracture is near the angle, to say whether it is oblique or transverse, but I have been unable to recognize a transverse fracture, except where, as in Cases 6, 14, and 17, the fracture was at the symphysis mentis. Of eighteen fractures, only three are recorded as quite or nearly transverse.

Fractures through the symphysis are rare, but it is quite common to find a fracture immediately in front of the angle, and at any point of the shaft between the anterior attachment of the masseter and the symphysis. I have seen no fracture of the coronoid process, and but one of a condyle.

In seven cases the bone was broken at two points, in one of which the two fractures were upon the same side. In one case the bone was broken at three points. Considerable fragments of the alveoli were detached in Cases 3, 5, and 14, and a fragment from the lower margin of the jaw in Case 7, but in neither instance was the effort to save the fragment successful.

It ought to be observed, also, that when the fracture has occurred at or near the angle, as in Cases 1, 9, and 18, and the second or third molars were disturbed, it has always become necessary eventually to remove them, and chiefly because they have interfered with the closure of the mouth.

In no instance has the bone finally refused to unite, although in a few instances it has been delayed, six, seven, ten, and even twelve or more weeks (Cases 15, 14, 2, and 18). I regard this fact as worthy of more especial attention, because of the extreme difficulty, if not actual impossibility, of preventing motion between the fragments, by any mode of dressing yet adopted. Any one who has observed attentively, must have seen, not only that his dressings are more often found disturbed and loosened, than in the case of almost any other fracture, unless it be the clavicle, and thus the fragments have been through all the treatment subjected to frequent changes of position, but, also, that even while the dressings remain snugly in place, the patient seldom is able to perform the necessary acts of deglutition, or to speak, even, without inflicting some motion upon the fragments.

Indeed, the rapidity with which this bone unites has, I think, been observed by other surgeons, and I have myself noticed one instance, in an adult person, Case 5, in which the bone was immovable at the seat of fracture on the seventeenth day, and, perhaps, earlier. In other instances, the union has been speedily effected after the removal of all dressings.

It would be very unsafe from these few cases to deduce any conclusions as to the effect of slight motion in retarding the union of broken bones. Yet I shall take the liberty of referring to some remarks upon this subject, published by myself, in the *Buffalo Medical Journal*, vol. x. p. 142, in connection with an article entitled "New Mode of Treating Ununited Fractures of the Humerus."

The amount of deformity resulting, also, from these fractures is usually very trifling, whatever treatment has been adopted. Seven are marked imperfect, but one of these cases was complicated with other injuries of which the patient died in a few days, and one was a case of delayed union, at the time of writing this report. Only five of the united fractures are imperfect, and in none of these is the imperfection such as to be noticed in a casual examination of the face. The deformity which is usually found, is a slight irregularity of the teeth, produced, in most cases, by a falling of the anterior fragment, and in one case by a slight elevation of the anterior fragment. But even this does not always interfere with mastication, and would often pass unnoticed by the patient himself. It is probable, too, that time, and the constant use of the lower jaw in mastication, will gradually effect a marked improvement in the ability to bring the opposing teeth into contact. I think I have observed this in several instances.

Where the prognosis is so favorable we shall, perhaps, feel less necessity for suggesting any modifications or improvements in relation to the surgical treatment. We cannot refrain, however, from making a few practical hints.

It will be seen that the few cases in which attempts have been made to restore a dislocated tooth to its socket, or to retain it when much loosened, have generally proved abortive, and especially where the fracture is near the angle, and a molar has been disturbed. I believe it would be better practice always to remove this latter when it is much disturbed, and in cases where teeth farther forward are loosened, we might be somewhat less persevering in our efforts to retain them.

The same remark applies, also, to fragments of alveoli, which have been detached completely, and are held only by the soft tissues about them. Complete exfoliation has sooner or later occurred, or the surgeon himself has found it at length necessary to remove them. (See Remarks on Fractures of the Upper Jaw.)

As to the employment of interdental splints, every one knows how inconvenient they are, both to the patient and to the surgeon, and I need not say that they ought to be dispensed with whenever it is possible to do so.

They are soon covered with an offensive sordes, and, as usually made, they irritate the mouth with their rough surfaces, and are constantly liable to displacement. Yet instances must occur in which these wedges are indispensable, and I wish to call your attention to the advantage which gutta percha possesses over every other material, in its adaptation to this purpose. I have already employed it in four instances, and I find no practical objections to its use.

The mode of preparing gutta percha, and of adapting it between the teeth is as follows: Dip a couple of pieces of the gum, of a proper size, into boiling water, and when they are sufficiently softened, mould them into wedge-shaped blocks, and, having wrapped each block with a piece of cotton cloth, carry them to their appropriate places between the back teeth. Immediately press up each horizontal ramus of the jaw until the mouth is sufficiently closed, and the line of the inferior margin is straight. In this position retain the fragments a few minutes, until the gum has sufficiently hardened. Meantime, it will be practicable, generally, to introduce the fingers into the mouth, and to press the gutta percha laterally on each side towards the teeth, and thus to make its position more secure. When it is sufficiently hardened, remove the splints for the purpose of determining more precisely that they are properly shaped and fitted.

The superiority of this splint is now at once perceived. If properly made, it is smooth upon its surface, and not, therefore, so liable to irritate the mouth as wood or cork, and it is so moulded to the teeth that it will never become displaced. My friend, Dr. Ganson, of Batavia, believes that the gutta percha will itself irritate the mucous membrane, and he, therefore, removed the splints which I had inserted in Case 11. I think he is probably correct, although I have never observed this effect myself. But in Case 11 the gutta percha was not covered with cloth, a precaution which I have since always adopted, and which I desire to recommend.

I have found the same material, also, particularly convenient as an outside splint, since it is so easily moulded to the face, and its form may be readily changed from time to time as the swelling increases or subsides. In compound fractures, also, where the wound is external, an opening can be made through the splint suitable for the dressing of the wound, and the discharge of pus. The piece from which this splint is made should be two or three lines in thickness, covered with cloth, and padded under the chin. It will be found convenient to cover it with cloth before immersing it in the hot water. The water should be nearly at a boiling temperature, so that the splint may become perfectly pliant; and it should be laid upon the face and allowed to mould itself while the patient lies upon his back.

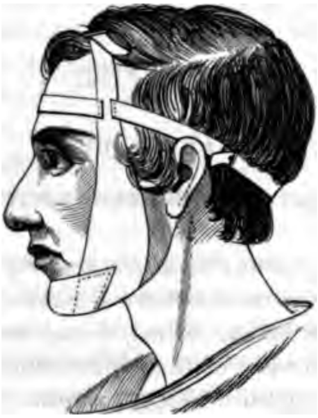
Having long experienced the insufficiency of the ordinary dressings to resist the tendency in the anterior fragment to fall downwards and backwards, when oblique fractures exist upon both sides, I devised some years since a leather dressing, which may be found useful hereafter in some cases.

It is composed of a firm leather strap, called maxillary, which, passing perpendicularly upwards from under the chin, is made to buckle upon the top of the head, at a point near the situation of the anterior fontanelle. This strap is supported by two counter straps, called, respectively, occipital and frontal, made of strong linen webbing. One of these, the occipital, is attached to the posterior margin of the maxillary strap about half an inch above the ear, and being carried around behind and *under* the occiput, it is finally buckled to the maxillary strap upon the opposite side, and at a point exactly corresponding to its origin. The frontal stay simply antagonizes the occipital; and having its origin and termination at the anterior margins of the maxillary strap, it is buckled horizontally across the forehead, and just above the eyebrows.

The maxillary strap is narrow under the chin to avoid pressure upon the front of the neck, but immediately becomes wider so as to cover the sides of the inferior maxilla and face, after which it gradually diminishes to accommodate the buckle upon the top of the head. The anterior margin of this band, at the point corresponding to the symphysis mentis, and for about two inches on each side, is supplied with thread holes, for the purpose of attaching a piece of linen which, when the apparatus is in place, shall cross in front of the chin, and prevent the maxillary strap from sliding backwards against the front of the neck. (Fig. 1.)

The advantage of this dressing over any which I have yet seen, consists in its capability to lift the anterior fragment almost vertically, and at the same time it is in no danger of falling forwards and downwards upon the forehead. If, as in the case of most other dressings, the occipital stay had its attachment opposite to the chin, its effect would be to draw the central fragment backwards. By using a firm piece of leather as a maxillary band, and attaching the occipital stay above the ears, this difficulty is completely avoided.

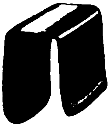
Fig. 1.



The Author's Apparatus.

NOTE.—At my request, Dr. Mütter, of Philadelphia, has furnished me with the following engraving of an instrument recommended and occasionally used by him in the treatment of such fractures of the inferior maxilla as are not easily retained in place by the usual apparatus. The instrument is a silver clamp, and it is intended to be placed over the teeth and alveoli in such a way as to traverse the seat of fracture. It is more simple than the apparatus of Lonsdale, while the principle upon which it acts is nearly the same. (Fig. 2.)

Fig. 2.



Mütter's Clamp for Fractured Jaw.

CHAPTER V.

CLAVICLE.

SEC. I.—INCOMPLETE FRACTURES.

CASE 1. *Partial fracture through the middle third. Result perfect.*

M. K., aged four years, fell down a flight of stone steps. Dr. G. Burwell and myself being called, found the right clavicle bent forwards at the outer end of the middle third.

We immediately applied Fox's apparatus.

Twenty-six days after the accident we examined the clavicle, and ascertained that the cure was completed, and without any deformity. During most of this time, however, the dressings were quite loose.

Eight years later I examined the arm, and there remained nothing to indicate the place where it had been broken.

CASE 2. *Fracture through the inner third. Result imperfect.*

Miss McN., aged nineteen years, broke her left collar-bone, by coming in contact with a bridge while riding on the Erie Canal. The fracture occurred at the outer end of the inner third. I saw her the day following. The fragments were not completely separated from each other, but bent forwards at the point of injury.

By pressure, I attempted to restore the ends to place, but with only partial success. I dressed the arm with Fox's apparatus.

Ten years afterwards, I find the bone still bent forwards at the point of fracture. The arm is often painful, and the clavicle is tender where the bend occurred. In other respects it is as sound as it was before.

CASE 3. *Fracture through the middle. Result not perfect.*

A. B., aged three years, fell from the sofa on to the floor, striking, it is thought, on her right shoulder. Two days after this she fell again, and then, for the first time, Mr. B. noticed the deformity of the clavicle.

She was brought to me three days after the second fall. There existed then a round, smooth projection at the outer end of the middle third of the clavicle. It felt hard, like bone. The line of the clavicle was not changed. I think, however, there existed a partial fracture, or that the bone having been bent, had at once resumed its original place spontaneously, and that the projection consisted of provisional callus.

I advised a handkerchief sling, simply to steady and support the arm.

Seven months after the accident, she fell sick and died. The projection continued at the time of death, only slightly diminished.

CASE 4. *Fracture through the middle. Result perfect.*

H. S., aged six years, was thrown from a horse, bending his left clavicle near its middle. Surgeon, Alden S. Sprague, of Buffalo. The projection in front was for several days very apparent, and was examined by myself at Dr. Sprague's request. The bone did not seem to be out of line. Dr. Sprague used no dressing. Five years after the accident, at the date of this report, I have examined the lad, and cannot find any trace of the original injury.

CASE 5. *Fracture through the middle third. Result perfect.*

Robert M. Frazer, aged twelve years, was run against by a wagon, breaking or bending both clavicles at about their centres. Dr. Wyckoff examined the fractures, and directed a simple sling, with cool lotions. He had previously attempted to straighten the bones, but was unable to do so completely.

On the second or third day, Dr. Wyckoff sent the lad to the college dispensary. I was unable, also, to restore the bones, and I recommended a continuance of the same simple plan. He was advised, however, to lie a few days upon his back. Six years after the accident, Dr. Mendenhall, of Cincinnati, examined the clavicles at my request, and informs me that no traces of the accident can be found. The projections remained some time, but just how long the mother does not remember.

I assume that this was a case of bending, in which the bones immediately resumed their places, and that what we supposed to be a projection of the fragment was provisional callus.

CASE 6. *Fracture through the middle third. Result perfect.*

Robert M. Frazer. (Same as Case 5; opposite arm.)

CASE 7. *Fracture through the middle third. Result perfect.*

T. D. S., aged two years, fell and broke or bent his collar-bone near its middle. Dr. H. O. Harmon, of Montpelier, Vt., dressed the arm.

Twenty-four years after the accident no traces of the accident can be discovered. The arm is perfect.

CASE 8. *Fracture through the middle third. Result perfect.*

E. M., aged fourteen years.

After thirty-one years I find it perfect, but Mr. M. says that a projection existed at the seat of the fracture about five years.

CASE 9. *Fracture through the middle third. Result nearly perfect.*

Samuel Chapin, aged five years, fell down a flight of steps and broke his clavicle, at the outer end of the middle third. The fracture was rather more complete than interstitial fractures are usually, the deformity being very manifest, and the projection quite angular and slightly movable.

Assisted by Dr. Barnes, I dressed the fracture carefully with Fox's apparatus, but we could not completely restore the fragments to place, neither at this nor at the subsequent dressings.

The fragments became firm in about twenty days, but a slight deformity remained at the seat of fracture.

CASE 10. *Fracture through the middle third. Result nearly perfect.*

(This fracture occurred in the same person as Case 19, but was not discovered until the twenty-fourth day. No treatment was, therefore, adopted, except so far as the treatment of the fracture in the opposite arm might influence this.)

Wm. Hefferman, aged fourteen years. Fracture of the right clavicle, at the outer end of the middle third. No displacement, and only a slight bend. On the twenty-fourth day this bend was accidentally discovered, surrounded with a distinct and perfect provisional callus. The bone was at this time so firm that it could not be bent by any moderate force applied at its two extremities.

CASE 11. *Fracture through the middle third, resulting in a slight deformity.*

E. A. W., aged twenty-three months. This child fell from her bed, a height of about two feet. The parents did not discover that any injury had been done to the collar-bone until about five days after the accident. Dr. George Burwell was then requested to see it, and found the same deformity existing as at present, and pronounced it a fracture. On the fourteenth day, at the instance of Dr. Burwell, the child was brought to me. The right clavicle was bent abruptly forwards, at about its middle. The projection was no greater now than on the fifth day, when it was first discovered. She used her arm freely.

We immediately made an attempt to straighten the bone by pressing upon the projecting angle, while, at the same moment, the scapula was drawn forwards. The efforts were repeated, and at each time the pressure made was firm, steady, and long continued. We could, however, produce no change in the form of the bone, and our efforts were discontinued.

No dressings had been previously applied, and I did not advise their application now.

After three years, I have again examined the bone, and find the projection has become smaller, but it is still quite manifest. The functions of the arm are in no ways impaired.

CASE 12. *Fracture through the middle third. Result imperfect.* (See cast in my private collection.)

B., aged seven years, of Rochester, fell and bent her right collar-bone, near its middle. Her parents did not discover the accident until after three weeks, when they immediately brought her to me. The bone was then firm, and by no reasonable pressure could it be made to yield; it was slightly bent forwards at the seat of fracture, and in this condition we were obliged to leave it. I advised no treatment.

CASE 13. *Fracture through the middle third. Result imperfect.* (See cast in my private collection.)

The cast of this case was furnished to me by Dr. Caleb Green, of Homer, N. Y., the very intelligent surgeon who treated the fracture, and I shall take the liberty of quoting his own account of it.

"Dec. 21, 1847, I was called to dress what was considered to be a fractured clavicle, of George Stone, a lad eight years of age. One of his playmates had tripped him in such a manner that he fell on his side, striking on the extremity of the left shoulder. I found that he was unable to raise the hand to the head. On examination, I discovered on the posterior edge of the clavicle, at the inner extremity of the external curvature, a point which was swollen, tender, and painful. The anterior edge of the clavicle was continuous, and there was neither crepitus nor displacement. Considering the age of the patient, and the appearance of the parts, I diagnosed bending of the clavicle forward with a *splitting out* of the posterior edge, and that the bone, by its elasticity, had resumed its ordinary direction. In order to be safe, however, I dressed the shoulder as for actual fracture of the clavicle, lest the fracture *might* have extended nearly through the bone, and there be subsequent displacement. The swelling subsided in four or five days, and as all seemed secure, I removed the dressings, and heard no more of the matter until the 11th of May, ult., when I was called to see the patient again, and found that he had met, the day before, with precisely the same accident, at the old point, and by the same cause, being tripped down by a playmate. This time the swelling and other symptoms of inflammation were greater than before. The anterior edge of the clavicle was entirely continuous, but he could not raise the arm. I merely directed him to keep to his bed until the swelling and inflammation should in a measure subside. In three or four days he was about. The callus left is not large, still it is quite evident. I have had one well-marked case of bending of the radius and ulna, in a boy eight years of age, and other surgeons have detailed similar accidents to the forearm, and, more rarely, cases of incomplete fracture, with bending of the humerus, leg, and thigh; but as a like bending of the clavicle is much less common than either of the others, I have thought this case possessed suffisient interest to make it worthy of being reported.

CASE 14. *Fracture through the middle third. Result perfect.*

W. P. L., aged thirteen years. The fracture occurred at the outer end of the middle third. Dr. John Thompson, of Scipio, Cayuga Co., N. Y., was employed. Soon after the union had been completed, it was refractured by accident, and it was re-dressed by the same surgeon.

Of the treatment adopted in this case I have no information.

I examined the clavicle thirteen years after the accident, and no trace of the original fracture could be seen.

I believe it proper to assume that this was a partial fracture.

The following case I have thought was of sufficient interest to authorize its introduction at this place, but as some doubt may exist as to the character of the fracture, I shall not include it in my tables.

Fracture through the middle third. Union with great deformity. (Specimen found in dissecting-room. See cast in my private collection representing the thorax before the bone was removed, and, also, cast representing the bone after it was removed.)

The deformity, as seen before the integuments were removed, was very remarkable—the left clavicle being bent downwards and forwards at a point just two inches and a half from the sternum, and deviating from its proper line about one inch. The patient was an adult.

The bone, on examination, was found firmly united at the point of fracture, but expanded into a sort of round knob, smooth and uniform upon its surface.

I suspect that this fracture occurred in early life, as it was transverse, and its knob-like projection resembled that which is so commonly found to exist for a long time upon any fractures or bendings of the bones in children. The nodose swelling, also, at the seat of fracture, was formed entirely at the expense of the anterior and superior surfaces of the clavicle. Posteriorly and inferiorly, the surface of the bone was only slightly, if at all elevated, and I presume this side of the bone was never completely broken.

It would have been impossible for the ends of a complete fracture of the clavicle, such as occur in adult persons, to have been retained in apposition until union was effected, while at the same time the fragments were so much out of line.

SEC. II.—COMPLETE FRACTURES.

DIVIS. 1.—*Middle Third.*

CASE 15. *Simple oblique fracture. Union with deformity.*

G. W. R., of Lockport, aged about fifty years. While residing temporarily in Buffalo, he fell and broke his left clavicle at the outer end of the middle third. Fracture simple and oblique. Dr. Barnes and myself were employed as his surgical attendants. We found the sternal fragment projecting and overriding the acromial fragment. Before applying any dressings, we attempted to reduce the fragments, so as to determine its practicability, but we did not succeed. Having assured Mr. R. that an overriding would be the result, we applied Fox's apparatus. After the application of the dressings, reduction still remained impossible. We observed, also, that whether the dressings were applied snugly or loosely, the fragments constantly moved upon each other, whenever he turned his neck or changed the position of the opposite arm.

On the eighth day, the callus around the fragments was very abundant.

On the twenty-first day, motion at the seat of fracture had nearly ceased, and at the end of four weeks the union was completed, but with the usual deformity.

Having been advised, subsequently, by a surgeon, that such a result was unnecessary, and that it implied unskilfulness or neglect on my part, he talked of withholding payment for my services, and this notwithstanding he had been from the first fully warned of the certainty of such a result. Until surgeons learn by their own experience, or from the testimony of others, what may be accomplished after these accidents, they will, no doubt, continue to regard such results as were obtained in this case, as evidence of wrong practice.

CASE 16. *Simple oblique fracture, and union with deformity.* (See cast in my private collection.)

Hugh Sarsfield, aged fifty-seven years; an Irish laborer; fell upon the outside of the left shoulder, breaking his left clavicle. Fracture at the outer end of the middle third. Simple and oblique.

I immediately applied a figure of 8 bandage, with a sling and axillary pad. The fragments were brought nearly to their proper places.

On the two following days the bandages were found slightly loosened, and the fragments displaced.

On the third day I applied a dressing after the method described and recommended by M. Velpeau,* except that I employed flour paste instead of dextrine. The dressing was very carefully laid on, and when completed the fragments were in place, and the patient expressed himself as being quite comfortable.

On the following day he complained greatly of its tightness. On the third day after its application, I found he had himself cut away the principal parts of the bandages, and that the fragments were again displaced. I therefore removed them entirely, and substituted the figure of 8.

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* Nouveau Eléments de Médecine Opératoire. Par A. L. M. Velpeau, à Paris, 1839, tom. i. p. 229.

The result has been that the bone has united, shortened about three-quarters of an inch, but the arm is as strong and as useful as before the accident.

CASE 17. *Simple oblique fracture, and union with deformity.*

Baby Golden Condy (female), Irish, aged forty years. By a fall she broke her right clavicle at the junction of the outer with the middle third. Fracture simple and oblique.

On the following day I dressed the fracture with a sling, axillary pad, and bandages. These were removed on the fourth week, when the bone was found united and shortened half an inch.

CASE 18. *Simple oblique fracture, and union with deformity.*

H. M., of Angelica, aged about thirty-five years. Fracture at the outer end of the middle third; oblique, occasioned by the kick of a horse.

Five days after the accident, Drs. Charles and Smith, of Angelica, both men of excellent reputation as surgeons, dressed the fracture with the eleven yard bandage of S. Brown, and with a pad in the axilla.

On the eleventh day from the accident, and six days after the first dressing, Mr. M. himself directed the bandages to be removed. It was done without the knowledge of his surgeons, because, he said, he could not endure the pain. The pain was chiefly on the outside of his humerus, near its middle.

Dr. Charles reapplied the same dressings, but with a smaller axillary pad.

About the twenty-third day, Mr. M. again removed the whole of the dressings, and from this time forward the bandages were several times applied, and as often removed, after a short time, by the patient.

Four months from the date of the fracture, Mr. M. consulted me. The bone had then united, and with the usual deformity. It was shortened three-quarters of an inch. He could, at this time, raise his arm but slightly from the side of his body.

CASE 19. *Simple oblique fracture, and union with slight deformity.*

Wm. Heffeman, aged fourteen years, was admitted into the hospital with a fracture of the left clavicle, having been run over by a horse and buggy. Fracture at the outer end of the middle third; simple and oblique, with the usual overlappings. He could raise his arm perpendicularly over his head, as easily as before the accident.

I replaced the fractured ends, and then dressed with a sling under the forearm and elbow, and a well-padded board across the back, to which the shoulders were securely laced. The retention of the fragments was complete.

On each successive day, however, I found the board displaced more or less to the right or left shoulder, and during most of the time the dressings were completely inoperative. Still they were continued with occasional slight modifications, until the cure was consummated.

On the thirteenth day I noticed callus upon the upper margins of the broken ends, but none in front or below. The same was noticed, also, on the twenty-first day, but it was less in amount.

The union was complete about the twentieth day, as motion was perceptible on the eighteenth, and it was lost on the twenty-first. It united with a slight overlapping and projection.

CASE 20. *Simple oblique fracture, and union with deformity.*

Almond D. Loomis, aged twenty-three years, fell, while wrestling, upon his left shoulder, breaking the left clavicle at the outer end of the middle third. Fracture simple and oblique, with the usual displacement. It was shortened one inch.

Assisted by Drs. Thompson and Hunt, I applied a sling with an axillary pad, &c. &c., but we could not retain the fragments in place. We then covered the elevated fragment with long and broad strips of adhesive plaster, which, for a time, brought the bone to its place.

I never saw the patient again, but I have been told that it finally united with the usual deformity.

CASE 21. *Simple oblique fracture, and ligamentous union.*

Edmund Nugent, aged twenty-five years, was admitted to the hospital in March, 1854. The house surgeon called my attention to his clavicle, and in presence of Drs. Winnie, Rochester, and Davis, I made the following examination and notes:—

Nugent is a stout Irish laborer. Sixteen years ago, when only nine years old, he fell from a horse and broke his left clavicle, at the outer end of the middle third. This was near Cork, in Ireland, and without consulting any surgeon or "handy man," he continued at his work, holding the tail of the plough, nor from that day forward did he employ a surgeon, or dress his arm, or cease from his work.

The clavicle presents now the same deformity which nearly all other similar fractures present after what is usually termed successful treatment, except that it is not united by bone. The outer end of the inner fragment rides upon the inner end of the outer fragment half an inch. The ligament uniting the two extremities is so long and firm that it can be distinctly felt, and the fragments may be moved upon each other with great freedom.

In order that we might determine the amount of injury which he had suffered from the ligamentous union, we directed him to lift weights placed on a table before him, while he was seated upon a chair. We ascertained from this experiment that with his left arm he could lift as much, within three ounces, as he could with his right, and he was not himself conscious of any difference. The muscles of the left arm seemed as well developed as those of the right.

CASE 22. *Simple oblique fracture, and union with slight deformity.*

Mary Beaumont, aged seventeen years, broke her left clavicle at the outer end of the middle third. Dr. Brodie, of Caven, C. W., treated the fracture.

Nine years after the accident she became an inmate of the Buffalo Hospital, and was under my care.

The outer end of the inner fragment is displaced upwards about half an inch. There is no shortening. The functions of the arm are perfect.

CASE 23. *Simple oblique fracture, and union with deformity.*

H. B. H., of Gaines, Orleans Co., aged forty-four years, a carriage maker by trade. Health generally pretty good, yet not very vigorous. Mr. H. fell down a flight of steps, about four feet, striking upon his right shoulder, and fracturing his right clavicle at the outer end of the middle third. He was not stunned by the fall, and his right shoulder and side were only slightly bruised.

Dr. Alfred Babcock, of Orleans Co., was employed. He applied a jacket (Brasdor's) with shoulder-straps, and a sling; no axillary pad. The jacket had no purpose except to attach the shoulder-straps, which were buckled over each shoulder. That on the right side was intended to keep down the inner fragment; and it was therefore buckled so tight that he was compelled constantly to in-

CASE 28. *Simple oblique fracture, and union with deformity.*

Mrs. T. M., aged thirty years, was thrown from a carriage, striking upon the outer end of the left acromion process. The left clavicle was broken at the outer end of the middle third, or about two and a half inches from the acromion process.

The outer end of the inner fragment was lifted upwards and forwards, and made to override, very slightly, the acromial fragment. By pressure alone it was easily replaced.

Assisted by my son, Theodore, I adjusted the fragments, and secured the arm with a sling, axillary pad, and bandages.

On the third day, I found the dressings loose, and the fragments displaced, although the usual care had been taken to prevent this result. I removed, therefore, the dressings, and substituted a carefully made Fox's apparatus.

On the seventh day, the patient having been seen by me, and the dressings tightened on each intervening day, I removed the apparatus, finding that it had no influence in retaining the fragments in place, and I substituted a dressing made entirely of adhesive plasters. For this purpose I used, at this single dressing, about two yards of plaster, made into strips of from three to four feet in length by one or two inches in breadth. A pad was placed in the axilla, and the arm and shoulder were then secured by various turns of the adhesive strips, some of which served as a sling for the elbow, some bound the elbow to the body, some drew back the shoulders, and some crossed the broken clavicle to bear down the outer end of the sternal fragment. When the whole was finished, the patient expressed herself as very comfortable, and the fractured ends were in place. The next day, the straps had slipped and loosened, and the fracture was again deranged.

On the thirteenth day, I becamed satisfied that no amount of care and diligence, short of a reapplication of them every few hours, was sufficient to prevent the straps from becoming loose, a circumstance mainly due to the warmth of the body, and to the motions of respiration. I therefore removed the straps, and applied the very beautiful and ingenious splint for fractured clavicles, invented by Mr. Day. This is a carved splint, made to fit the back, shoulders, and neck, and furnished with sling, straps, loops, etc. Before applying this splint, I had a large and soft cushion constructed and placed on the concave surface of the splint. Its application was easy and simple, and promised to be efficient.

The patient wore this apparatus five days, during which time it required daily, indeed almost hourly, readjustment, as the splint would constantly slide upwards against the neck and head, and the shoulder-straps would roll and excoriate the axilla. To remedy the latter difficulty, I had large circular tin plates constructed, furnished with pads, which were placed in front of the axilla, and over which the shoulder-straps were made to pass. The sliding upwards of the splint, however, still continued, and was irremediable; and, on about the twenty-first day, this also was removed, and no dressings were subsequently employed, except a sling for the forearm. At this time no union had occurred. No provisional callus could be felt; the fragments remained slightly displaced, just as when I first saw her. In short, the treatment had accomplished nothing.

Soon after union occurred, and, two months from the time of the fracture, I found the bone firm, with an overlapping of three-quarters of an inch. The functions of the arm were also already completely restored. At the end of one year, no changes have occurred.

CASE 29. *Simple oblique fracture, and union with deformity.*

John Moran, a sailor, aged twenty years, fell upon his left shoulder, and broke the left clavicle at the outer end of the middle third.

At the end of fourteen days, he consulted Dr. Charles Wilcox, Surgeon to the Marine Hospital at Buffalo. This was his first application for surgical advice. Dr. Wilcox applied the figure of 8 dressing; on the following day, it had become loosened and drawn into strings, and, on the third day, John removed it altogether, and has had no treatment or dressing since, except that he has generally kept his hand in the bosom of his coat.

The bone united in about twenty-one days, and, at the end of six weeks, when I examined it carefully, the clavicle was shortened one-quarter of an inch; provisional callus could be detected. The arm was as strong and as useful as before.

CASE 30. *Simple oblique fracture, and union with deformity.*

Daniel Sharp, æt. 16 years, broke his right clavicle, at the outer end of the middle third. A surgeon of respectability in New York city dressed and treated the fracture.

Seventeen years after the accident, I examined the arm, and found a projection and overlapping of the fragments, to the extent of three-quarters of an inch. Its displacement upwards was rather greater than is ordinarily seen, yet the arm was as strong and as useful as before. Patient cannot describe the treatment.

CASE 31. *Simple oblique fracture, and union with deformity.*

Henry West, aged 25 years, broke his left clavicle at the outer end of the middle third. Surgeon Williams, of Liverpool, England, dressed the fracture, and continued his charge until the cure was completed.

Two years after the fracture had occurred, West came under my care at the hospital. The clavicle is shortened one-quarter of an inch, and a slight deformity remains at the seat of fracture. The functions of his arm are perfect. I have no knowledge of the treatment.

CASE 32. *Simple oblique fracture, and union with deformity.*

James Roach, aged about 40 years. A barrel of flour fell against his left shoulder, breaking the left clavicle at the outer end of the middle third: oblique and simple. The fragments were displaced in the usual manner.

Assisted by Drs. Eastman and Vanderventer, I applied dressings consisting of a sling, axillary pad, and bandages. Over each shoulder I placed a moulded compress, made of numerous layers of cloth and paste; this, when dry, was to serve as a *point d'appui* for bandages, tapes, &c.

The whole being arranged, we made an attempt to reduce the fragments, but we were unsuccessful.

The same thing happened, indeed, which has several times happened to me before. I could not, nor could the gentlemen with me bring the fragments into apposition, and this notwithstanding we placed our knees against the back, and drew forcibly upon the shoulders; and notwithstanding also we placed a firm pad in the axilla, and made use of the arm as a lever until the patient could no longer endure the pain. Each gentleman satisfied himself that it was not practicable to reduce the fragments by either of these modes, and on the following day Dr. Myers, of the U. S. Army, and Dr. Pupikofer repeated the attempt in my presence, and with like success.

In one way alone could the fragments be brought even temporarily into contact, viz: by pressing the acromial end of the sternal fragment downwards and backwards, which fragment we
f, constantly projecting upwards and for-
was inclined, at its sternal end,

lapping was inevitable; the

dressings were carefully applied, and, with slight modifications, were continued until the cure was completed.

The fragments united about the thirtieth day, with half an inch of shortening, and with projection of the outer end of the inner fragment.

CASE 33. *Simple transverse fracture, and union without deformity.*

Patrick Rowan, aged 26 years, fell while wrestling, and broke the right clavicle at the outer end of the middle third. The fracture was complete, but transverse.

I reduced the fragments soon after the accident, and noticed that unless disturbed, they would remain in place for a few seconds, at least.

I applied the cross described in Case 21; on the seventh day, motion between the fragments had ceased, and on the twenty-eighth day the apparatus was removed, and the union found to be complete without shortening or deformity.

CASE 34. *Simple oblique fracture, and union with deformity.*

S. E., of Buffalo, aged about 25 years. Mr. E. was thrown upon his shoulder, by jumping from the cars while they were in motion. The fracture was at the outer end of the middle third, simple and oblique.

During the first four days, I applied a figure of 8 bandage with an axillary pad and a sling. Finding, however, that the fragments could not by these means be kept in place, I directed our ingenious instrument maker, Mr. Seiffert, to construct, under my direction, an apparatus such as I hoped might prove more efficient in the management of these fractures. It consisted essentially of an upright and a transverse plate of brass, secured upon each other in the form of a cross, and intended to be placed against the back. The transverse bar extended from acromion to acromion, to which the shoulders were to be securely fastened back by leather shoulder caps and straps, with buckles. This bar was padded, especially along its middle, where it was intended to rest between the blades of the scapulæ. The vertical bar was only designed as a support for the crossbar, its lower end being received into a pocket made in a broad leather belt, the belt to be fastened around the hips.

This apparatus I applied on the fifth day, and I continued to see him daily until the cure was completed. Motion between the fragments had ceased on the fourteenth day after the accident, and on the twenty-fifth day I removed the apparatus entirely, the bone being quite firm. There was, however, the usual overlapping and deformity at the seat of fracture, but rather less than occurs in a majority of cases.

I cannot say that the apparatus answered my expectations, since it was constantly inclined to fall off from the shoulders, either to the right or to the left, and this defect I have not yet succeeded in remedying.

CASE 35. *Simple oblique fracture, and union with deformity.*

Mrs. ——, of England, aged 28 years, fell and broke her left collar bone obliquely at the outer end of the middle third. A surgeon in London dressed the fracture.

Twelve years after the accident, I found the usual deformity and a shortening of half an inch; the arm in other respects, perfect. No record of treatment.

CASE 36. *Simple oblique fracture, and union with deformity.*

Mary McCarty, aged 12 years, of Ireland. Mary broke one of her collar bones, by a fall upon her shoulder. The fracture was complete, and occurred at the outer end of the middle third. She says that a skilful Swiss surgeon dressed the fracture. Twenty-three years after the accident, she became an inmate of the Buffalo Hospital, and I examined the arm.

The clavicle is shortened half an inch, and slightly bent at the seat of fracture. For many years, Mary says, the deformity was very striking. Functions of arm not impaired.

CASE 37. *Simple oblique fracture, and union with deformity.*

Silas Usher, aged 46 years, fell from a scaffolding about fifteen feet, striking upon his shoulder, and breaking the left clavicle, near the junction of the outer third with the inner two thirds. Dr. Peter Knox, of Watervleit, dressed the fracture immediately, with an axillary pad, sling and bandages. On the third day, the fragments were discovered to be displaced, and Dr. Thorn, of Troy, was summoned.

Dr. Thorn removed the dressings and substituted an apparatus composed of bandages, and without any axillary pad. He also placed an adhesive plaster over the fracture; on the tenth day Dr. Thorn removed all the dressings, and did not reapply them; but the [illegible] was continued until it fell off.

Eleven years after the fracture, I found the bone united, but overlapped one-quarter of an inch; the inner fragment overriding the outer, the functions of the arm perfect. He thinks it was united in about two weeks after it was broken.

CASE 38. *Simple transverse fracture, occurring at the seat of an old comminuted fracture. Union without additional deformity or maiming. Prosecution of the surgeon, and successful defence.* (See cast in my private collection.)

Burgess, aged about 30 years, of Buffalo, N. Y. (This is the same man whose first fracture is reported in Case 52.) Burgess was riding in a buggy, when the horse became frightened by the passage of a train of cars, and he was thrown upon the ground, striking upon his right shoulder.

Dr. George Burwell, an intelligent and skilful surgeon of Buffalo, was called to dress the fracture.

On the eighth day, Dr. Burwell requested me to see Burgess with him. I found him wearing Fox's apparatus, which had been carefully made and applied, but which was now loose from his own interference. The clavicle was broken at the seat of the old fracture, but only at one point—at the point nearest the shoulder. The vertical or intercepted fragment remained firmly fastened to the inner portion of the bone. Burgess had not told Dr. Burwell, nor did he tell me that the clavicle had ever been broken before, and we did not suspect the intended imposition. We were unable to explain satisfactorily the fixed and immovable condition of the central fragment, which we repeatedly attempted to restore to place. On attempting to adjust the portions which were movable, also, we found that no force applied to the shoulders was sufficient to make any sensible impression upon them. They still continued to occupy almost precisely the position in which we first found them. We assured him, therefore, that deformity was inevitable, and that we would apply the dressings only so as to maintain some degree of rest between the fragments, but that we should not attempt to overcome the shortening, &c. To this Burgess assented with a readiness which at that time surprised us, but which subsequent developments rendered consistent. We observed, also, the emaciated condition of the arm, and the deformity of his hand and wrist. These conditions he ascribed to a dislocation of the shoulder which, he said, occurred when he was twelve years old.

Dr. Burwell continued to attend him until the union of the bone was completed, about twenty-one days.

Soon after his recovery, Burgess commenced his well-planned and systematic conspiracy, by prosecuting the Niagara Falls Railroad Company, for having been the cause of his accident, and of all the deformity and maiming from which he was now suffering.

This suit resulted in a verdict in favor of the company.

A few months later, Burgess refused to pay his bill for surgical services, and threatened to prosecute Dr. Burwell for damages. Dr. Burwell immediately gave the account to his attorney for collection, and Burgess, through Mr. Williams, his counsel, put in a defence of "unskilful treatment." The cause was tried October 3d, 1846, in a Justice's Court, Justice Childs presiding, and when the testimony was partly before the magistrate, Burgess's counsel withdrew the defence, and Dr. Burwell's account was allowed. Burgess, however, had no property, and the judgment was never paid.

The matter did not rest here. He at once commenced a suit against Dr. Burwell for mal-practice. The first trial of this suit occurred in June of 1847, in the Erie County Circuit, Judge Stevens presiding.

The evidence was most conclusive in favor of Dr. Burwell, but the jury could not agree, and were dismissed. Eleven of the jurors wished to return a verdict for the defendant, Dr. Burwell, and one insisted upon damages to plaintiff.

The second trial occurred in June, 1849. The same facts were elicited here as on the two former trials, viz: That he had repeatedly falsified his own statements in relation to the cause of his maiming. That he had at one time ascribed it solely to an injury of the wrist, received when he was twelve years old; at another, to an old dislocation of the shoulder; at another, entirely to his recent accident. He never admitted, so far as we could learn, that the clavicle had ever been broken until recently, but it will be seen at once that, with the knowledge of his character and motives now disclosed, no other supposition is probable. The jury having heard the testimony, promptly returned a verdict for the defendant.

CASE 39. *Simple fracture, and union with very little deformity.*

Francis Carpenter, aged thirty-two years, of Lille, France. Francis fell sideways upon the ground, striking upon the outer end of his left shoulder, and breaking the left clavicle at the outer end of the middle third.

Dr. Barras, of Lille, dressed the fracture with bandages and a sling, using no axillary pad, and no band to draw the shoulders back. The dressings were continued eight weeks.

Ten years after, while an inmate of the Buffalo Hospital, I examined the arm. The clavicle had united without shortening, but only bent forwards at the seat of fracture. He thinks it never overlapped, nor was there ever any sharp projecting point of bone, the arm is as strong as before the accident. Probably it was a transverse fracture, and possibly not complete.

CASE 40. *Simple oblique fracture, and union with deformity.*

Joseph Price, aged about twenty years, broke his clavicle at the outer end of the middle third. Oblique and simple.

I applied Fox's apparatus, but did not see him but once or twice after the first dressing, as he soon left town. Two years from the date of the accident, I examined the arm again. The fragments had united, overlapped, and with the usual deformity. It is shortened half an inch. He is a good-natured fellow, and ascribes all the unfortunate result to his own negligence. His arm is not yet quite as strong as before the clavicle was broken.

CASE 41. *Simple and oblique fracture, and union with deformity.*

C. A. W., aged forty-seven years, was struck by the hawser of a vessel, breaking the right clavicle, and, at the same time, several ribs on the right side of his body. Dr. Sprague, a very experienced surgeon of Buffalo, was called, and applied dressings consisting essentially of a sling and axillary pad, bandages, &c. The condition of his side, however, did not permit the dressings to be applied very snugly.

Some person having suggested to Mr. W. that the arm was not properly in place, that the shoulder was out of joint! and the clavicle not united! he consulted me in June, 1851, about four years after the accident.

The fracture had occurred at the outer end of the middle third, and the inner fragment was still overriding the outer fragment. The clavicle was united, but shortened one inch. The projecting point of the inner fragment was quite sharp and prominent, and occasionally tender and painful. The right humerus is properly in its socket, but the muscles about the joint are atrophied, leaving a flatness upon the outside and behind. In front, there exists rather an unusual fulness. He is unable to raise his arm to a right angle with his body.

CASE 42. *Simple oblique fracture. Union with deformity, and paralysis of the arm.*

Mrs. ——, aged 51 years, of New York. Mrs. —— was thrown from her carriage, breaking the right clavicle obliquely at the outer end of the middle third. Dr. Congar, of Niagara Falls, dressed the fracture with Fox's apparatus. This dressing was continued three weeks, and was not particularly painful.

At this time, by a change of residence, she became the patient of Dr. J., a very excellent surgeon of Erie County, N. Y. The fragments were found to be overlapped, and Dr. J., with a hope of restoring them to place, applied a figure of 8 bandage, with an axillary pad. During the short time these dressings were continued, the pain was excessive; and, notwithstanding the free use of anodynes, they became wholly insupportable, and were removed at the end of fourteen hours.

Dr. C., of the same county, removed the dressings, and reapplied Fox's apparatus, which, with occasional removals, remained on four weeks longer. In all this time, repeated efforts were made to bring the fragments into place.

Forty-eight days after the accident, she consulted me. The clavicle was then united, and overlapped half an inch. The whole arm was swollen, painful, and very tender, with total inability to move it.

I removed all the dressings, and, during the time she remained under my care, in a private room of the hospital, there was a gradual improvement in the condition of her arm, in respect of swelling and tenderness, but the paralysis did not much abate.

CASE 43. *Fracture and union, with slight deformity.*

Miss A. W. R., of Westfield, Chatauque County, aged 5 years, by a fall broke her right clavicle near its middle. Dr. Jones, of Westfield, dressed the fracture. It was found impossible to retain the fragments in place, although Dr. Jones readjusted them at three separate times. Union occurred, with a palpable deformity, which was still manifest thirty-five years after the accident, when I had an opportunity of examining the bone. The arm, also, during the whole of this period, has been occasionally painful. In all other respects it is well.

CASE 44. *Fracture and union, with deformity.*

John Lewis, of Painted Post, N. Y., aged 32 years, fractured his clavicle near its middle. Simple and oblique. Dr. Hoyt, of Painted Post, was employed.

Eight years after the fracture, I found the clavicle shortened one quarter of an inch, and pushed forward at the seat of fracture. The arm was not as strong as before the accident. I find no mention in my records of the treatment.

CASE 45. *Fracture and union, without deformity.*

S., aged 15 years, fell on the ice, breaking his left clavicle. The fragments were never much displaced. Dr. John Trowbridge, of Buffalo, and myself, in attendance.

We applied at first a back-board splint, which seemed to keep the fragments, for a day or two, very well in place; but, after this date, it was found too troublesome, and we substituted a simple sling.

Five years after the accident, I examined the arm carefully, and find it neither shortened nor displaced. Yet the line of fracture can be distinctly felt. It occurred at the outer end of the middle third, and was oblique.

DIVIS. 2.—*Inner Third.*

CASE 46. *Simple transverse fracture half an inch from sternum. Union without deformity.*

Mrs. Winfield Dunmoody, aged 80 years, fell down a flight of steps, breaking the right clavicle about one inch from its sternal end.

Dr. John Trowbridge, who was in attendance, invited me to see the case on the day following the accident. Motion and crepitus were distinct, but the displacement was very inconsiderable, and scarcely perceptible. We applied no dressings, but directed only that the patient should be kept quiet. The bone united in the usual time, and without either deformity or maiming.

DIVIS. 3.—*Outer Third.*

CASE 47. *Fracture between the coracoid process and acromion. Union, with slight deformity.*

J. H., aged about 21 years, in jumping from the cars while they were in motion, broke his left clavicle at a point between the coracoid process and the acromion, viz: about half an inch to the acromial side of the coracoid process. The outer end of the inner or sternal fragment was slightly elevated, and overlapped the acromial about one-quarter of an inch. The displacement and deformity were slight, as compared with those cases in which the fracture had occurred on the sternal side of the coracoid prócess. Dr. Wilcox and myself in attendance.

We laid across the back a broad, thick plate of gutta percha, previously covered with cotton cloth, and to this, as a back splint, we secured the shoulders. A sling and axillary pad were also used, with bandages. The fragments were very easily brought into place and retained.

The next day I found the dressings loose, and I readjusted them with care. On the sixth day, the whole being loose, the bandages, &c., were reapplied, and he was dismissed for his home, where he came under the care of Dr. Lansing Briggs, of Auburn. Dr. B. continued the dressings, but the bone has united with a slight projection and a shortening of about one-quarter of an inch.

CASE 48. *Simple oblique fracture, and delayed union.*

Michael Connor, aged 55 years, fell from a scaffolding and broke his left collar-bone, about one inch from the acromial end. He was sent immediately to the Bellevue Hospital, New York City. "Dr. Murdock dressed the fracture," says Michael, "with a collar upon my right shoulder, a pad under my left shoulder, and a sling under my elbow." The apparatus was retained upon the arm and shoulder about five weeks.

At the end of six weeks, Michael became an inmate of the Buffalo Hospital, and, upon examination, I found that the fragments were overlapped one-quarter of an inch, and that bony union had not yet taken place. Moving the fragments upon each other, produced an audible click at the seat of the fracture. He could not lift his arm.

DIVIS. 4.—*Comminuted.*

CASE 49. *Union with deformity.*

R. L., aged thirty-three years, was thrown from a horse, and broke his right clavicle in two places. One fracture was at the inner end of the outer third, and the other at a point nearer the sternum.

I was called to dress it on the third day, and, on the fourth day, I applied Fox's apparatus. I could not, however, retain the fragments in place, nor prevent motion.

On the twenty-second day, one fragment had united, but the other remained loose. I substituted the figure of 8 bandage for Fox's apparatus, and applied a compress, &c., over the fracture.

On about the twenty-eighth day, union was effected throughout, but with overlapping and the usual deformity.

Eight years after the accident, I examined the arm, and find the bone united with a shortening of half an inch. The arm is as strong and as useful as before. The overlapping is in front, and not above.

CASE 50. *Union with deformity.*

——, aged twenty-nine years, of Buffalo, was thrown backwards from a wagon, striking upon his shoulder. I saw the man soon after the accident, and dressed the fracture at my college dispensary. The right clavicle was broken at two points, the intercepted piece being about one inch and a half in length, and considerably displaced. The outer fracture was at the inner end of the outer third of the clavicle.

It was noticed that, contrary to what has been supposed to be the general fact in such cases, he could easily raise his arm and hand to his head, and also, that by no force or art could the fragments be made to resume their places. Fox's apparatus was then applied, and the patient distinctly informed that shortening and deformity were inevitable. I have never seen the patient since.

I have learned, however, that the results which I predicted have occurred. It is shortened about half an inch.

CASE 51. *Union with deformity.* (See cast in my private collection.)

Charles Clarke, of Otisco, aged forty-six years, was thrown from his horse, breaking his left collar-bone at two points, viz: at its middle, and at a point about one inch nearer the sternum.

Dr. Ashbel Searle, of Otisco, was in attendance. Dr. Searle placed the arm in a sling, and secured it with bandages, but used no axillary pad. The dressings were at first exceedingly painful, and Dr. Searle was obliged to loosen them.

The bones united, and, fourteen years after the accident, I examined the arm, and found a very marked deformity in consequence of the displacement of the intercepted fragment. The clavicle is shortened half an inch. His left shoulder is lower than his right. Functions of the arm perfect.

CASE 52. *Union with deformity, and maiming.* (See Case 38.)

Burgess, aged twelve years, then a resident of London, England. The right clavicle was broken at two points, viz: at the junction of the outer third with the inner two thirds, and also at a point one inch and a half nearer the sternum, the intercepted piece being thrown at right angles with the line of the clavicle, and remaining in that position until bony union was accomplished.

The vertical, intercepted piece projected a little more than half an inch both above and below, and the opposite fragments united with it on its anterior and posterior surfaces. Clavicle is shortened one inch.

I have not been able to ascertain what treatment was adopted by the London surgeon, but the result has been a general marasmus of the arm, inability to lift the arm, and a permanent abduction of the hand to the ulnar side, with flexion of the fingers.

He continued, however, to follow his occupation as a carpenter, shoving the plane more by the motions of his body than of his arm.

CASE 53. *Union with deformity.*

B. L. Derrick, aged about fifty years, a feeble, non-muscular man. Mr. D. fell about fifteen feet, striking upon the back and outer part of the left shoulder. Dr. Smith, of the Army, Dr. Wyckoff, and myself, made the first dressing. The clavicle was broken obliquely at the inner end of the outer third, and also at a point about one inch nearer the sternum. The intercepted fragment was quite movable. The acromial end of the sternal fragment was lifted upwards and carried forwards, and also rode upon the other fragment one inch.

We first attempted to replace the fragments before the dressings were applied, but we could not.

We then placed a very broad and firm gutta percha splint upon the back and shoulders well moulded and covered with cotton cloth. To this we drew back firmly the shoulders, but without effecting an adjustment of the fragments.

We then elevated the elbow and shoulder with a properly con-
suspended from the opposite shoulder. The effect
nd partially conceal in the tissues the project-

ing ends, but a careful examination showed that the riding still continued.

Finally, we adapted a large and pretty firm pad to the axilla, and using the arm as a lever, we attempted to carry out the shoulder. When great force was applied, the fragments moved about three lines, but no force which we could apply was sufficient to carry out the shoulder so as to accomplish exact reduction.

Relaxing, therefore, our efforts, and bringing the arm to that position in which the pressure ceased to be painful, we applied the requisite retentive bandages, and left the patient, assuring him that a shortening was inevitable.

After a few days, I became satisfied that the back splint was insufficient, and only burdensome, and I substituted for the whole dressing a simple figure of 8, with a sling, &c.

The result has been a union, with a shortening of one inch, the same as before any dressings were applied. There is also the usual projection of the fragments.

Fractures of the Clavicle.

INCOMPLETE FRACTURES.

No.	Age when it occurred.	Time since it occurred.	Sex.	Character of fracture.	Right or left side.	Point of fracture.	TREATMENT.	RESULT.				
								United or not.	When united.	Amount of shortening.		Perfect or imperfect.
1	4 y'rs	8 y'rs	F.	Simple and trans.	R.	Outer third	Fox's apparatus	United		No shortening.	Cannot trace the fracture	Per.
2	19 "	10 "	"	"	L.	Inner third	Fox's apparatus	"		"	Slight projection in front	Imp.
3	3 "	7 mo's	"	"	R.	Middle third	Handkerchief sling	"		"	Slight projection at time of death	"
4	6 "	5 y'rs	M.	"	L.	"	Surgeon employed, but no treatment adopted	"		"	No trace of the fracture	Per.
5	12 "	6 "	"	"	R.	"	Sling and supine position	"		"	No trace of the fracture	"
6	12 "	6 "	"	"	L.	"	Sling and supine position	"		"	No trace of the fracture	"
7	2 "	24 "	"	"		Middle	Surgeon employed, but treatment unknown	"		"	Cannot determine the point of fracture	"
8	14 "	31 "	"	"		"	Unknown	"		"	A projection existed at seat of fracture about five years, but it has now entirely disappeared	"
9	5 "		"	"		Mid. 3d	Fox's apparatus	"	20 d'ys	"	Slight projection	Imp.
10	14 "	4 w'ks	"	"	R.	"	No treatment, but rest	"	21 "	"	At the end of four weeks there was a slight projection	
11	2 "	3 y'rs	F.	"	"	Middle	Unsuccessful attempts to straighten the bone on the 5th and 14th days. No other treatment	"	14 "	"	Slight projection	"
12	7 "	2 w'ks	"	"	"	"	Not seen by a surgeon until the 14th day. No treatment	"	14 "	"	Slight projection on the 14th day	
13	7 "	6 mo's	M.	"		Outer third	"Dressed as for a complete fracture"	"		"	Slight projection	"
14	13 "	13 y'rs	"	"		Middle third	Surgeon employed, but treatment unknown.	"		"	No trace of the fracture	Per.

COMPLETE FRACTURES.

MIDDLE THIRD.

No.	Age when it occurred.	Time since it occurred.	Sex.	Character of fracture.	Right or left side.	Point of fracture.	TREATMENT.	United or not.	When united.	Amount of shortening.		Perfect or imperfect.
15	50 y'rs	2 y'rs	M.	Simple and ob.	L.	Outer end of middle third	Fox's apparatus	United.	24 d'ys	½ inch	Inner fragment projects forwards and upwards	Imp.
16	57 "	1 "	"	"	"	"	Figure of 8. Velpeau's bandage	"		¾ inch	Inner fragment projects. Arm as strong as before	"
17	40 "	5 w'ks	F.	"	R.	"	Sling; axillary pad, &c.	"	28 "	½ inch		"
18	35 "	4 mo's	M.	"		"	Brown's bandage; axillary pad, &c. &c.	"		¾ inch	Considerable projection of inner fragment. Inability to lift the arm	"
19	14 "	4 w'ks	"	"	L.	"	Back splint; sling; no axillary pad	"	20 d'ys	¼ inch	(Could lift his arm above his head before it was dressed.) Fragments project slightly	"
20	23 "	1 y'r	"	"	"	"	Sling, &c.	"			Fragments override	"

Fractures of the Clavicle.—Continued.

No.	Age when it occurred.	Time since it occurred.	Sex.	Character of fracture.	Right or left side.	Point of fracture.	TREATMENT.	RESULT.				
								United or not.	When united.	Amount of shortening.		Perfect or imperfect.
21	9 y'rs	16 y'rs	M.	Simple and oblique	L.	Outer end of middle third	No treatment	United by ligament		¼ inch	Fragments move freely upon each other. No impairment of functions of arm	Imp.
22	17 "	9 "	F.	Simple and trans.	"	"	Treatment unknown	United		None	Fragments displaced in direction of diameter of bone half an inch	"
23	44 "	1 "	M.	Simple and oblique	R	"	Brasdor's jacket; sling; no axillary pad	"	21 d'ys	¾ inch	Paralysis of arm; curvature of spine, &c.	"
24	14 "	3 mo's	"	"	L.	"	Day's splint. Fox's apparatus	"	11 "	¼ inch	Fragments ride, but do not project much	"
25	22 "	4 "	F.	"	R.	"	Fox's apparatus.	"		½ inch	Slight projection	"
26	35 "	5 y'rs	M.	"	"	"	Treated by a surgeon, but treatment unknown	"		½ inch	Right shoulder falls. Arm as useful as before	"
27	33 "	14 "	"	"			Treated by a surgeon, but treatment unknown	"		½ inch	Arm occasionally painful	"
28	30 "	1 "	F.	"	L.	"	Fox's apparatus; adhesive plaster dressing; Day's splint, with axillary pad, &c.	"	26 "	¾ inch	Projection of inner fragment. Functions of arm perfect	"
29	20 "	6 w'ks	M.	"	"	"	Fox's apparatus during three days, and after third day no treatment	"	21 "	¼ inch	Arm as useful as before. No more projection than is usually found	"
30	16 "	17 y'rs	"	"	R.	"	Surgeon employed, but treatment unknown	"		¾ inch	Remarkable projection of inner fragment. Functions of arm perfect	"
31	25 "	2 "	"	"	L.	"	Surgeon employed, but treatment unknown	"		¾ inch	Slight projection. Functions of arm perfect	"
32	40 "	2 mo's	"	"	"	"	Sling; paste compresses; axillary pad, &c.	"	30 "	½ inch	Projection of inner fragment	"
33	26 "	4 w'ks	"	Simple and trans.	R.	"	Back splint; sling; no axillary pad	"	7 "	Not any	Line of bone perfect	Per.
34	25 "	2 mo's	"	Simple and oblique		"	Back splint; sling; no axillary pad	"	14 "	½ inch	Slight projection	Imp.
35	28 "	12 y'rs	F.	"		"	Surgeon employed, but treatment unknown	"		½ inch	Slight projection at seat of fracture. Functions of arm perfect	"
36	12 "	23 "	"	"		"	Surgeon employed, but treatment unknown	"		⅛ inch	Slight bend at seat of fracture. For many years the deformity was much greater. Functions perfect	"
37	46 "	11 "	M.	"	L.	"	Bandages; adhesive straps; no axillary pad	"	14 "	¼ inch	Slight projection. use of arm perfect	"
38	30 "	1 "	"	Simple and trans.	R.	"	Fox's apparatus	"	21 "		This was a second fracture at the same point. The original deformity was not increased. (See case 52.) Prosecution	
39	32 "	10 "	"		L.	"	Sling; bandages; no axillary pads	"		Not any	A slight forward displacement	
40	20 "	2 "	"	Simple and ob.			Fox's apparatus	"		½ inch	Slight impairment of strength	"

Fractures of the Clavicle.—Continued.

No.	Age when it occurred.	Time since it occurred.	Sex.	Character of fracture.	Right or left side.	Point of fracture.	TREATMENT.	RESULT.				
								United or not.	When united.	Amount of shortening.		Perfect or imperfect.
41	47 y'rs	4 y'rs	M.	Simple and oblique	R.	Outer end of middle third	Sling; bandages; axillary pad, &c.	United		1 inch	Considerable projection of inner fragment. Use of arm impaired, &c. &c.	Imp.
42	51 "	3 mo's	F.	"	"	"	Fig. of 8; Fox's apparatus; axillary pad, &c.	"		½ inch	Projection of fragments, paralysys, and swelling of arm	"
43	5 "	35 y'rs	"	Simple	"	"	Surgeon employed, but treatment unknown	"			Slight projection; occasionally painful	"
44	32 "	8 "	M.	Simple and oblique		"	Surgeon employed, but treatment unknown	"		¼ inch	Slight projection. Arm not as strong as before	"
45	15 "	6 "	"	"	L.	"	Back board splint, &c.	"			No deformity	Per.
INNER THIRD.												
46	80 y'rs	2 mo's	F.	Simple and trans.	R.	One inch from sternum		United		Not any		Per.
OUTER THIRD.												
47	21 y'rs	1 y'r	M.	Simple and trans.	L.	Outside of coracoid process	Gutta percha back splint	United		¼ inch	Inner fragment projects slightly	Imp.
48	55 "	6 w'ks	"	Simple and oblique	"	One inch from acromion process	Fox's apparatus	Delayed 6 w'ks		½ inch	Unable to lift his arm	"
COMMINUTED.												
49	33 y'rs	8 y'rs	M.	Commin. and oblique	R.	Inner end of outer third and middle	Fox's apparatus; fig. of 8, &c.	United	22 and 28 d'ys	½ inch	Use of arm not impaired	Imp.
50	29 "	1 "	"	Commin.	"	"	Fox's apparatus	"		½ inch	He could raise his arm to his head before it was dressed	"
51	46 "	14 "	"	"	L.	Middle, and one inch nearer sternum	Sling, &c. No axillary pad	"		¾ inch	Remarkable deformity. Shoulder falls. Functions of arm perfect.	"
52	12 "	18 "	"	"	R.	Inner end of outer third, and 1½ inches nearer sternum.	Employed a surgeon, but treatment unknown	"		1 inch	Wasting and palsey of arm. Contraction of hand and fingers	"
53	50 "	3 "	"	"	L.	"	Gutta percha back-splint; fig. of 8, etc.	"		1 inch	Inner fragment projects	"

REMARKS.

> **"Yet it is lamentable, even at the present day, to see how some *fashionable* doctors torment their patients, in cases of fracture of the clavicle, with tight bandages, which, after all, have little or no power in keeping the bones *in situ*."—Note to *Works of Hippocrates*, Sydenham Society's ed., vol. ii. p. 585.**

I have found it convenient to divide fractures of the clavicle into "Incomplete" and "Complete," and again to arrange complete fractures under several heads, according as they may be simple or comminuted, or as they may have occurred through the middle, inner or outer thirds.

Boyer denied the existence of the incomplete or partial fracture, and calls it "an occurrence utterly impossible." (*Boyer on Bones*, Amer. ed., vol. i. p. 17, 1805.) But Boyer had reference, no doubt, to what has been called sometimes a partial fracture in *adult* bones, and not at all to that accident which we are now considering.

Meding, Turine, Dupuytren, Malgaigne, South, Chelius, Syme, Miller, B. Cooper, Norris, Barton, Gibson, with others, recognize its existence, and no one, perhaps, at the present day, doubts its possibility. J. Rhea Barton, of Philadelphia, has also written upon this subject a very interesting memoir, entitled, "Remarks on certain Injuries of the Bones in Children." (See *Philadelphia Medical Recorder*, vol. iv. p. 13, 1821.)

Fergusson compares it to the fracture of a "walking stick;" South to the cracking of a "fresh willow," but it is more generally known as the "green stick" fracture.

It is necessary, I think, to admit at least two forms or degrees of incomplete fractures, the first of which is unaccompanied with any lesion of the periosteum, and the second is attended with this additional circumstance. A "refinement" which, I ought to say, Mr. Erichsen thinks unnecessary.

I am disposed, however, not only to admit these divisions, but even to extend them, and to regard interperiosteal fractures as existing in three conditions. First, as a mere bend, in which the fibres upon the one side are compressed, and upon the other side expanded, without any actual disruption, except what may be interstitial, and too trivial to be reckoned. Second, as a fracture of the central fibres of the bone, while the outer, more completely cartilaginous and more elastic fibres, preserve their integrity, a condition which M. Blandin claims to have first explained, and which he considers, without sufficient reason, it seems to me, as the sole cause why, in partial fractures, the fragments do not separate. Third, as a fracture of the middle and outer fibres, generally upon one side only, but within the periosteum.

It is certain that these several injuries do occur; the bone being sometimes merely bent, as happens most frequently in infancy. In such cases, the bone will often resume its form spontaneously, as does the twig of willow after having been bent upon itself. I have reported seven of these cases, and the oldest patient was ten years, while of the second and third variety the oldest child was fourteen years.

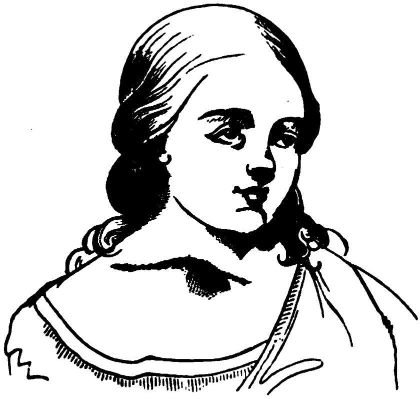
Since, however, they possess this feature in common, namely, that the periosteum is not broken, and there are, consequently, no abrupt angles or sharp spiculæ pushing out at the seat of fracture, but only a smooth, knuckle-like projection, it is proper to speak of them as one form.

In the other form of incomplete fracture, the periosteum yields more or less, and a thin fragment of the outer fibres of the bone may be made to fly off from the point of fracture, as in Case 13. Or it may break transversely to its diameter (as occurs most frequently), but not completely across. No crepitus can, therefore, be discovered, unless, by imprudent efforts to examine or to straighten the bone, it should be entirely separated, and then at once both crepitus and displacement will be manifest. To this form of accident belong Cases 2, 9, 13, and 14, the oldest of which patients was nineteen years.

Unlike complete fractures of the clavicle, a considerable proportion of these occur rather to the sternal side of the middle, and they are seldom oblique.

The direction of the displacement is usually forwards and a little downwards. It will be observed, however, that the amount of displacement existing in a bone broken in this way, and for some time united, cannot always be measured by the amount of anterior projection at the seat of fracture, since in Case 3, as well as in Case 13, reported to me by Dr. Green, and I think, also, in several other cases which have come under my observation, the line of the axis of the bone is completely restored, and there exists only a node-like projection in front, with no corresponding depression behind, indicating, as Dr. Green has very properly suggested, one of those fractures in which the bone has been for the moment bent forwards, but has also immediately, in consequence of its elasticity, resumed its original position. The projection, which is soon after found to exist, is probably, therefore, an effusion under the periosteum—a callus. This may explain, also, why, in some instances, the parents do not discover the fracture until after several days, in one instance, Case 11, not until after five days, and in Case 12, not until after three weeks. There was at first no deformity, because no effusion had yet occurred.

Fig. 8.



Incomplete Fracture. Case 12.

Even in those cases where the bone remains bent, most, if not all of the callus will be found in front, or in the direction in which the bone has yielded. This was very marked in the specimen obtained from the dissecting-room,* where the angular deviation was extraordinary, but there was no callus behind the point of fracture. A circumstance which may so easily mislead us as to the amount of actual bending, ought not to be forgotten.

The prognosis in these simple accidents is generally very favorable. Where the bone is broken, but has by its own elasticity resumed its former position, the deformity, depending only upon the presence of callus, will sooner or later disappear, yet not entirely, I think, until after several months or even years. Where the fracture is a little more complete, and the fragments are not immediately restored spontaneously, the restoration can sometimes be accomplished with ease by moderate pressure upon the projecting point, but this only when the case is early presented to the surgeon, and not always even then, as some of my cases have proven. In partial fractures of the bones of the forearm, occurring in children, I have not experienced much difficulty in straightening the bones at any time within a week or two, but the same observation will not hold good with regard to the clavicle. The forces cannot be so conveniently applied, and its repair and consolidation are much more rapid.

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* This case follows Case 14, but it is not included in the tables, or in the general enumeration.

I agree with Syme, that, in cases of partial fracture, whether it occurs in the clavicle or elsewhere, when the fragments are once restored, mechanical support will hardly be required; at least only in a few cases. If, however, such support becomes necessary, the treatment ought to be essentially the same as for complete fractures.

The division of complete fractures of the clavicle, according as the accident occurs through the inner, outer, or middle third, has been adopted for the convenience of prognosis. By the outer third, I mean all that portion of the clavicle included between its scapular extremity and the internal margin of the conoid ligament, be it more or less than one-third. The remaining portion is intended to be divided equally into two separate thirds. The peculiarities of these several portions, in respect of anatomical relations, liability to fracture, results, &c., will explain the propriety of the divisions.

Fractures which are *complete* occur mostly after the bones have become firm and unyielding. They are also generally oblique, seldom comminuted, still more rarely compound. The point of a bone at which a complete fracture usually occurs, is at or near the outer end of the middle third, and a little to the sternal side of the coraco-clavicular ligament. It might be more exact to say that the fracture *commences* usually at this point, and from thence extends, more or less obliquely, downwards and inwards towards the sternum, the entire length of the fracture, including, sometimes, nearly one-third of the bone.

Bransby Cooper, Miller, Liston, Fergusson, and many others, have spoken of this fracture as occurring most frequently at about its "middle," and in the last American edition of *Fergusson's Surgery*, is a plate, intended, I suppose, to indicate the point where the fracture usually takes place, and it is here represented as a little to the sternal side of the centre. The fact is, however, that it generally gives way at what Syme calls "the beginning of the acromial curvature," and near the junction of the outer third with the inner two-thirds.

Why the bone should break more frequently at this point, especially in the adult, it is not difficult to understand. It is smaller here than elsewhere, and less supported by muscular and ligamentous attachments. At this point, also, the axis of the bone begins pretty abruptly to curve forwards, more abruptly in the adult and male than in the child and female.

When, therefore, a blow is received upon the point of the shoulders—and it is in this way, by a *contre coup*, that the fracture most frequently occurs—the force of the blow conveyed through the outer portion of the clavicle is suddenly arrested, and expends itself upon the point where the direction of the axis is changed.

Of 48 simple fractures of the clavicle recorded by me, 40 have occurred through the middle third, and a great majority, about 35, at the acromial end of this third; and of 58 fractures, including the incomplete and comminuted, which latter are always broken twice, 39 have occurred at or near this point.

The direction of the displacement is almost always such, that the inner end of the outer fragment is depressed, and falls below the outer end of the inner fragment. It is also found often a little behind the inner fragment.

Syme has seen a case in which the outer fragment overrode the inner; and M. Gueretin reports another case, in the *Presse Médicale.* Hippocrates also speaks of this accident as known to him. Desault saw several cases, and has recorded one. (*Treatise on Fractures and Dislocations*, Amer. ed., p. 16.)

An overlapping and consequent shortening of from one-quarter of an inch to one inch, is almost always present in oblique fractures, occurring at the outer end of the middle third, and not unfrequently in fractures occurring at other points, and in transverse fractures.

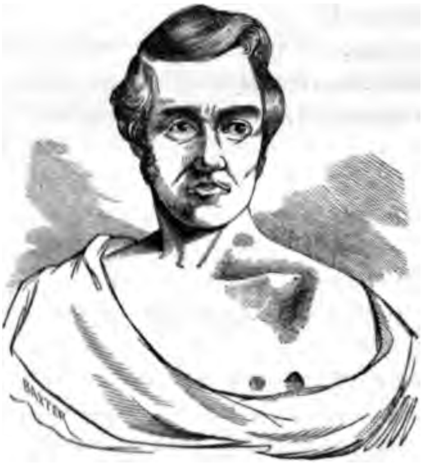
A double fracture, or a simultaneous fracture, occurring in both clavicles, seldom occurs. I have recorded two cases (*four fractures*, three of which are incomplete), both occurring in young boys. (Cases 5, 6, 10.)

Malgaigne says it has only happened to him to see it once in 2,358 cases, at the Hôtel Dieu, and he can recollect only five other examples. And of 158 cases of broken clavicles reported from the New York Hospital, it is stated to have occurred in only four. These gentlemen, however, only report hospital cases, and they have reference, doubtless, to complete fractures. Incomplete fractures are not so likely to be seen in such institutions, but are more common, I suspect, in private practice.

Prognosis in this fracture deserves especial attention. In no other bone, except the femur, does a shortening so uniformly result. Of 39 complete fractures, only 7 have united without shortening; and of 25 simple, oblique, complete fractures, which have occurred at or near the outer end of the middle third, only one has united without any shortening (Case 45); and in this case the patient was but fifteen years old, and the fragments were never much displaced, nor can I say that the treatment had anything to do with the result. Three cases of complete *transverse* fracture, occurring at the same point, have united without shortening.

The shortening varies from one-quarter of an inch to one inch, and the fragments are almost always found lying in the position in which we have described them to be at the first—the outer end of the inner fragment being above, and often a little in front of the outer: sometimes, especially in lean persons, and when the fracture is very oblique, presenting a sharp and unseemly projection.

Fig. 4.



Complete Fracture. Case 16.

The presence of a small amount of ensheathing callus soon after the cure is completed, sometimes increases the deformity. It is rarely seen to encircle the bone completely, but, if present, it is usually most abundant in the direction of the salient points of the fracture, that is, above and below; so that, unless the examination is made with care, the projecting points of callus which remain, sometimes after many years, may be easily mistaken for an intercepted fragment turned at right angles to the axis of the bone. In the case of partial fracture, reported by Dr. Green, a similar circumstance was observed, but which his natural shrewdness soon enabled him to explain.

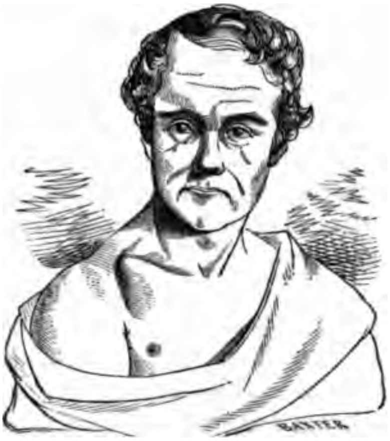
Complete fractures through the sternal third of the bone are exceedingly rare, and I have been able to record, from my own observation, but one case, which occurred in an old lady, eighty years of age. The fracture was within half an inch of the sternum, transverse, and it united without any dressings, and without deformity. The rhomboid ligament must, in such accidents, generally prevent any considerable displacement.

It is not quite so rare to find a complete fracture through the acromial third of the clavicle, or through that portion beginning at the acromion process, and terminating at the sternal margin of the internal fasciculus of the coraco-clavicular ligament.

I have recorded two cases, in both of which a slight riding, about one-quarter of an inch, has resulted; and in one, the union was delayed at least beyond six weeks. The deformity, or projection, was in both cases very trifling.

Comminuted fractures have been observed by me five times. The intercepted fragment generally falls off from the line of the other fragments, and cannot easily be restored. I have never seen a compound fracture of the clavicle, although the outer end of the inner fragment often projects in such a way as to excite a serious apprehension that it will push through the skin.

Fig. 5.



Comminuted Fracture. Case 52.

The clavicle usually unites with great rapidity, generally within twenty days. In one instance (Case 33), a transverse fracture, the union seemed to be tolerably firm at seven days. Wallace reports one case from the Pennsylvania Hospital, which was cured in eight days, and another in nine days (*Amer. Med. Journ.*, vol. xv. p. 115). Velpeau says the clavicle will unite in from fifteen to twenty-five days; Benjamin Bell, in fourteen.

I have only once seen a case of ligamentous union (Case 21), and in one other instance, already referred to, union was delayed at least six weeks.

It is seldom that the arm suffers any serious ultimate injury, whatever may be the mode of union. This is most remarkably confirmed by the instance of ligamentous union, in which the functions of the arm are very little, if at all, impaired. Chelius, however, quotes a case of artificial joint of the clavicle where "the use of the limb was not destroyed, but impaired." (*Op. cit.*, vol. i. p. 603.) The paralysis in Case 23 was not due certainly to the fracture, nor is it probable that it was due to the treatment, but only to some injury entirely foreign to the fracture. In Case 42, also, no paralysis existed previous to the repeated attempts which were made to overcome the riding of the fragments. I have no censure for the excellent surgeon who sought thus to accomplish an end so desirable. He was attempting to do only what others claimed to have done in similar cases, and with the same apparatus. A failure, therefore, was certain to bring discredit upon his skill, or to subject him to the charge of not having employed proper diligence and care in the use of the means at his command. But it has added another instance to that mentioned by Dr. Parker, in which the use of the axillary pad has resulted in at least temporary paralysis of the arm, and to this class, also, probably belongs the case treated by Desault himself, and reported by Bichat, in which the paralysis began only on the third day, and was complete on the seventh. How many more the records of private or hospital surgery, if carefully examined, might show, I cannot tell. In Case 38, where the bone had been previously comminuted, a paralysis existed, but whether it was due to the severity of the original injury or to the treatment, could not be satisfactorily learned. Mr. Earle has recorded a case in which the clavicle was comminuted, and the "nerves converging to form the axillary plexus" were so injured that paralysis of the arm ensued. (Samuel Cooper's *Surg.*, Amer. ed., vol. ii. p. 323.)

In a case where conclusions must be drawn so mortifying to our professional pride, it is but fair that the writer should be permitted to defend the value of his evidences by a reference to the opinions of other practical surgeons.

"Great difficulty has been experienced in treating this fracture." (Syme's *Principles of Surgery*, p. 266, Philadelphia ed., 1832.)

"The indications of treatment are plain, but, unfortunately, not very easily fulfilled." (Miller's *Practice of Surgery*, 3d Amer. ed. from 2d Edinburgh, p. 309.)

"Fractures of the clavicle will often cause greater trouble than those which are considered of a more serious character, and the utmost pains will not, on all occasions, suffice to prevent a slight prominence of the inner fragment." (*Practical Surgery.* By Wm. Fergusson. 4th Amer. ed. from 3d London, p. 215.)

"Setting of this fracture is easy, yet only in very rare cases is the cure possible without any deformity." (*System of Surgery.* By J. M. Chelius, of Heidelberg, with notes by South. 1st Amer. ed., vol. i. p. 603.)

"It is considered, also, that the close union of the fracture of the collar-bone depends less on the apparatus than on the position and direction of the fracture; (therefore, in spite of the most careful application of this apparatus, some deformity often remains.") (*Ibid.*, p. 605.)

The following statements of M. Velpeau are found in a letter addressed to the editor of the *Boston Medical and Surgical Journal*, by J. Willis Fisher, dated Paris, Sept. 16, 1846.

Mr. Fisher remarks that the report is drawn in part from his own notes, and partly from "the report published in the *Gazette des Hôpitaux*." It is the annual summary of M. Velpeau's practice at La Charité, for the year ending Sept. 1846.

"The fractures of the clavicle, less numerous than ordinarily, have been only four. They have proved these three often repeated propositions: First, that contrary to the general opinion, the patients can carry the hand to the head when they have a fractured clavicle. Secondly, that the consolidation of the bone demands only from fifteen to twenty-five days, and not six weeks or two months. Thirdly, that with all the bandages imaginable, we cannot prevent fracture of the two internal and oblique thirds from leaving a deformity." (*Bost. Med. and Surg. Journ.*, vol. xxxv. p. 212.)

"Fracture of the clavicle is almost always followed by deformity, Thus Desault, Fox, and Wattman accomplish the indication to carry the shoulder back, by lifting the humerus while the elbow is in *front* of the body, and Guillou accomplishes the same indication by lifting the humerus when the elbow is a little *behind* the body. Chelius, also (vol. i. p. 603), says: "The elbow, as far as possible, is to be laid backwards on the body."

Sargent, who believes that with Fox's apparatus "the occurrence of deformity is the exception," and not the rule, and prefers it to all others, has treated three cases by Guillou's method, and is perfectly satisfied with its operation. (*Note to Miller's Practice*, p. 311.)

Hollingsworth has also treated one case successfully by Guillou's method, and adds his testimony in its favor. But how shall we explain these equal results from opposite modes of treatment? Is the indication to carry the shoulders back, which Fox sought to accomplish by pressing the elbow upwards and backwards, as easily attained by pressing the elbow upwards and forwards? Or are we not compelled to infer that there has been some mistake as to the precise amount of good accomplished by the apparatus in either case? Moreover, Coates, Keal, and others, instruct us that the only safe and proper position for the humerus is in a line with the side of the body, and that it must neither be carried forwards nor backwards.

Paulus Ægineta, Boyer, Desault, Pecceti, Liston, Fergusson, Samuel Cooper, Erichsen, Miller, Skey, Fox, Smith, Norris, Sargent, recommended an axillary pad, while Richerand, Velpeau, Dupuytren, Benjamin Bell, Syme, deny its utility, or affirm its danger. Dr. Parker has seen one patient in whom paralysis of the arm resulted from the pressure upon the brachial nerves, in the attempt "to *pry* the shoulder out"—(Samuel Cooper's *Surgery*, with notes by Parker, vol. ii. p. 328), and I have myself recorded another.

Desault's plan, which took its origin, as Velpeau thinks, in the spica of Glaucius, under various modifications, is recommended by Delpech, Cruveilhier, Lasere, Flamant, Samuel Cooper, Fergusson, Liston, Cutler, Physick, Coates, and Gibson; while by Velpeau, Syme, Colles, Chelius, Samuel Cooper, and Parker, it is regarded as inefficient and troublesome. Says Mr. Cooper: "In this country, many surgeons prefer Desault's bandages; but I do not regard them as meeting the indications, and consider them worse than useless." (*Op. cit.*, vol. ii. p. 328.)

The dextrine bandages, or *apparatus immobile*, of Blandin, Velpeau, and others, constitute only another form of the bandage dressing of Desault.

The sling, in some of its forms, is employed by Richerand, Huberthal, Colles, Miller, Fox, Smith, Sargent, Norris, Neil, Benjamin Bell, Bransby Cooper, Earle, Chapman, Keal, and by a large majority of the English surgeons; while Dr. Gibson declares the *sling* bandage employed so much by the English, "the most inefficient, contemptible, and injurious of all contrivances for such purposes."

No apparatus, perhaps, has been so generally employed, among American surgeons, as that form of the sling introduced by Dr. George Fox into the Pennsylvania Hospital in 1828, since which time no other has ever been used in that institution for the treatment of broken clavicles.

Sargent says of it: "Fractures of the clavicles, treated by this apparatus, are daily dismissed from the Pennsylvania Hospital, and by surgeons in private practice, cured without perceptible deformity." (*Sargent's Minor Surgery*, p. 180. 1848.)

Norris, in a note to *Liston's Practical Surgery*, affirms that "the chief indications in the treatment of fracture of the clavicle are *perfectly* fulfilled by the use of this apparatus." (*Op. cit.*, Am. edit., p. 47.)

Smith, in his *Minor Surgery*, declares that Fox's apparatus accomplishes "perfect cures" in very many cases, and that it is "a very rare thing for a simple case to go out of the house (Pennsylvania Hospital) with any other deformity save that which time cures, viz: the deposition of the provisional callus." (*Op. cit.*, p. 209.)

Such testimony in favor of any dressing demands respectful attention; and I shall not be regarded as detracting from the respect due to these authorities, when I express my belief that it is in deference to the distinguished reputation of the surgeons who have during the last thirty years had charge of the services in that hospital, and who have been so loud in its praise, that the use of this apparatus has, with us, become so general. I believe, also, that, in some measure, this general preference is due fairly to the intrinsic excellences of the dressing. But I must be permitted to express a doubt whether it has made deformities of the clavicle "the exception, instead of the rule," with us. I have used this dressing, as may be seen by a reference to my cases, oftener than any other form, and yet my success has by no means been so flattering as has been the success of these gentlemen. I have seen others employ it, also, and with pretty much the same results. Nor ought it to be forgotten that, in

Great Britain, by far the greater majority of surgeons employ an apparatus essentially the same. I have seen it in many of the hospitals, and Mr. Bickersteth, one of the surgeons of the Liverpool Infirmary, informed me, in 1844, that it had been in use with them as long as thirty years. All that has justly been said against the English mode of dressing by slings, is equally true of this; and whatever has been affirmed of the danger of using an axillary pad, applies as much to this as to any other mode of using the same.

I believe, however, that, in the Pennsylvania Hospital, the axillary pad employed is not so large, and, especially, not so thick, as that recommended by Desault, and in this respect it is plainly an improvement; but then, in the same proportion that it is made less thick, it is less powerful to accomplish the indication in question; and if it merely fills the axillary space, then it is no longer a fulcrum upon which the arm is to operate as a lever, but it is only, in its effect "retentive."

Regarding, then, the importance of this question to the interests of surgery, and observing the wide differences of opinion which are entertained here and elsewhere as to the real value of this dressing, is it asking too much of these gentlemen, that they will present us some more precise statistical testimony? It will be observed that its advocates claim for it what is not to-day, at least, claimed for any other apparatus, viz: that, under its use in the Pennsylvania Hospital, and in the hands of private practitioners, so far as they have seen, deformities have become the "exception." It is affirmed to answer "perfectly" *all* the indications. By which it must be intended to say, that, in addition to both of the other indications, that also, which has always heretofore been found so difficult, if not impossible, the carrying out of the shoulder, is in a majority of cases perfectly accomplished. The clavicles are not shortened.

If it is intended, however, to say that a shortening is not generally prevented, but only that no unseemly projection of the fractured ends will be found to result, I reply, that then it does not answer *all* the indications, and I beg, further, to suggest that the avoidance of an upward projection seems, to me, to depend much more upon that part of any apparatus which lifts the shoulder, and which belongs to a multitude of other forms of dressing as well as to that in question, than upon that which forces the shoulder out, and it may be accomplished, in a majority of cases, as well without an axillary pad, with a mere sling, as with it. But, in fact, my experience has convinced me that the absence or presence of such a projection, after union, is due more to the circumstances of the fracture, as to whether it is more or less oblique; and still more especially, to the degree of roundness, or emaciation of the patient, than to any form, or part, or condition of the apparatus. It will be found more distinct in oblique fractures than in transverse, and much more marked in thin persons than in plump, or fat persons, and more so in muscular than in non-muscular. In short, I affirm that such a projection has occurred as often under my observation, when this dressing has been used, as it has when other forms have been employed.

Finally, while I deprecate incautious assumptions in regard to the capabilities of any form of dressing for broken collar-bones, a disposition to which is manifested by more than one advocate of special plans,* I am ready to bear my humble testimony in favor of that one of whose claims I have taken the liberty to speak so freely, and which is usually known in this country by the name of Fox's apparatus, consisting essentially of a sling, axillary pad, and bandages to secure the arm to the chest, and to which the stuffed collar is a convenient accessory, but admits of various modifications, answering the same ends. Among the considerable variety of dressings which I have used, this, either with or without such slight modifications as I shall presently suggest, has seemed to be most simple in its construction, the most comfortable to the patient, the least liable to derangement (if I except Velpeau's dextrine bandage), and as capable as any other of answering the several indications proposed.

No apparatus is better able to answer the first indication, namely, "to carry the shoulder up," and thus to bring the fragments in line. If, as not unfrequently happens, the outer end of the inner fragment is also carried a little upwards and forwards, it may be, in some measure, replaced by inclining the head to the injured side, or by a carefully adjusted compress and bandage. But it is not probable that any patient will consent to remain a long time in a position so unnatural and constrained; nor is it very easy, as the experiment will show, to maintain a steady pressure upon this portion of the broken clavicle.

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* The bone will be found to lie quite smooth, to remain of its proper length, to unite, generally, within twenty days, and without any unseemly exuberance of callus. —*Liston.* At length, Desault proved that a feeble and unskilful mode of treatment was the sole cause of a want of success, and that, by being more correct and judicious, art might be as successful here as in other fractures. They supposed that to be a superabundant callus, which was nothing but a displacement of the fragments. These visionary hypotheses ceased to exist as soon as this displacement was prevented by a proper apparatus.—*Ibid.*

The second indication, " to carry the shoulder back," is certainly much more difficult of accomplishment than the first; and it does not seem to me to be fully met by the sling dressing, but, until some mode is devised less objectionable than any I have yet employed, or than any, the mechanism of which I have seen described, I see no alternative but to trust to that action of the muscles attached to the scapula, by which, as Desault first explained, when the shoulder is lifted perpendicularly, it is also in some degree carried backwards, and that, too, it has occurred to me frequently to observe, just as much as when the upward pressure is made with the elbow placed in front of the body.

It is my belief, however, from the evidences now before us, that the third indication "to carry the shoulder out" still remains unaccomplished; that it cannot be claimed for this, or for any other apparatus yet invented; that, in a certain class of cases which I have sufficiently indicated, constituting a vast majority of the whole number, it is able to prevent a riding of the fragments. Nor, seeing the difficulties in the way, and the amount of talent which has been already devoted to their removal, have I much confidence that this end, so desirable, and so diligently sought, will ever be attained. Yet it is presumptuous, perhaps, to say what the skill and ingenuity of a profession whose labors never cease, may hereafter accomplish.

Having already expressed my preference for the sling, I have only to add what I consider necessary modifications in the form of this dressing recommended by Dr. Fox.

Dr. Coates, in the excellent paper already referred to, calls attention to the danger of making too much pressure upon the brachial artery and nerves, when the axillary pad is used, and the arm is, at the same time, carried forwards upon the body. In bringing the elbow forwards so as to lay the forearm across the body, the humerus is made to rotate inwards, and the brachial artery and nerves are brought into more direct apposition with the pad. The same objection must hold, only in a greater degree, to M. Guillou's method of carrying the forearm across the back.

The humerus ought then to be permitted to hang perpendicularly beside the body, and thus the nerves and bloodvessels will be removed in a great measure, yet not entirely, from pressure. The pad (to be employed only as a part of the contentive means, and not as a fulcrum) should be firm, but scarcely thicker than is necessary to fill completely the axillary space, when the elbow is made to press snugly against the side of the body.

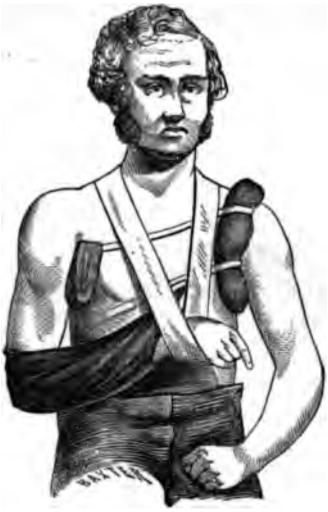
In consequence of having placed the elbow further back than is recommended by Dr. Fox, it will be necessary, also, to vary, in some way, the suspensory tapes; those coming from the humeral portion of the arm-tray must pass in equal numbers, and in opposite directions—before and behind the body—towards the stuffed collar; and each set of front and back tapes, attached to the humeral portion of the tray, must be in pairs, for the convenience of tying. I find it convenient also to secure the arm to the body by two or three turns of a roller, applied always with great care, so that its pressure shall be in no degree painful or uncomfortable.

APPENDIX.

AMERICAN INVENTIONS AND MODIFICATIONS OF APPARATUS FOR THE TREATMENT OF FRACTURED CLAVICLES.

Fig. 6. *George Fox's Apparatus.*—"Consists of a firmly stuffed pad of a wedge shape, and about half as long as the humerus, having a band attached to each extremity of its upper or thickest margin; a sling to suspend the elbow and forearm, made of strong muslin, with a cord attached to the humeral extremity, and another to each end of the carpal portion; and a ring made of muslin stuffed with cotton to encircle the sound shoulder, and serve as means of acting upon and receiving the sling." (*Sargent's Minor Surgery*, p. 149.)

Fig. 6.

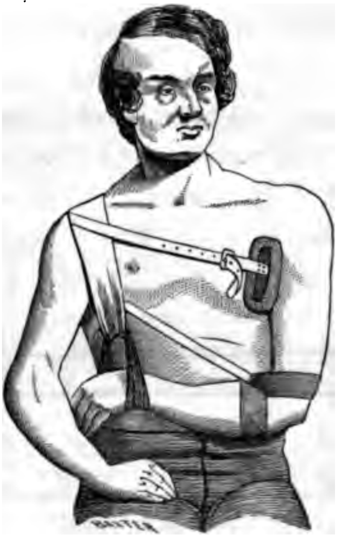


George Fox's Apparatus.

Fig. 7. *E. Bartlett's Apparatus.*—"For an axilla pad, roll a strip of woollen flannel, four or five inches wide, around the axilla strap, to the size required.

"Put on the collar. Apply the pad, and pass the strap under the collar, thus securing each in its place.

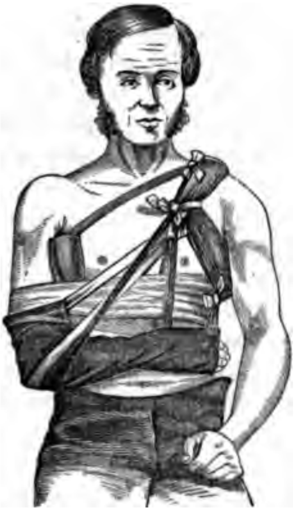
Fig. 7.



E. Bartlett's Apparatus.

"The sling, being first attached to the collar by the forward strap, is made to receive the arm of the side affected, when the straps at the back

Fig. 8.



The Author's Apparatus.

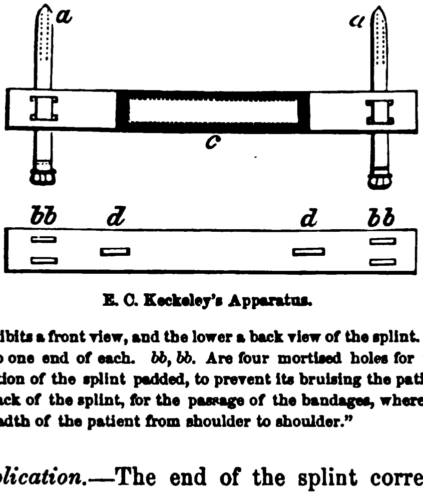
of the sling should be buckled, one behind, the other forward, to the ends of the collar with requisite tightness to reduce the fracture and maintain the ends in apposition.

"The apparatus may be used for either side, by changing the attachment of the sling." (*Dr. Bartlett.*)

Fig. 8. *The Author's Apparatus.*

Fig. 9. *E. C. Keckeley's Apparatus.*—"The splint, of which the accompanying figures give a representation, is two feet three inches long and three and a half inches wide.

Fig. 9.



E. C. Keckeley's Apparatus.

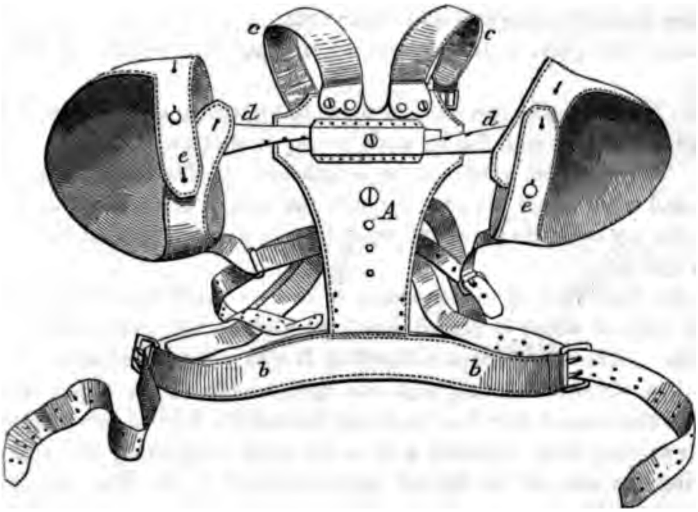
"The upper figure exhibits a front view, and the lower a back view of the splint. *a, a.* Are two bandages with buckles attached to one end of each. *bb, bb.* Are four mortised holes for the passage of the two bandages *a, a.* *c.* A portion of the splint padded, to prevent its bruising the patient. *d, d.* Two loops of leather, tacked on the back of the splint, for the passage of the bandages, where the mortised holes are too far apart for the breadth of the patient from shoulder to shoulder."

"*Mode of Application.*—The end of the splint corresponding to the uninjured side is to be pressed close to the back of the shoulder, and retained so by drawing the bandage tight, and retaining it by means of the buckle. Previous to fixing the bandage, it should be passed through two loops on a small pad, which is to be placed in the axilla. This pad is used for the purpose of preventing the cutting of the bandage. After passing the other bandage through two loops, on a large cuneiform pad, which is placed in the axilla of the injured side, it is drawn sufficiently tight and secured by the buckle. The last thing to be done is to place a handkerchief, doubled into a triangular form, in such a manner over the arm, the front and back parts of the thorax, as that it shall draw and confine the arm of the injured side close to the body, give it support, and prevent its falling down." (*Am. Journ. of Med. Sciences*, xv. 115, 1834.)

Fig. 10. *Welch's Apparatus.*—Back view, complete, with the exception of the sling and axillary cushion.

Fig. 11. Front view, complete, as it appears when applied. The frame, consisting of the dorsal piece with the thoracic and cervical arms, is formed of flexible metal, which yields sufficiently to adapt it always to the motions of the spine and chest. The lateral or thoracic arms encircle the body, and the vertical or cervical arms, passing upwards, outwards and

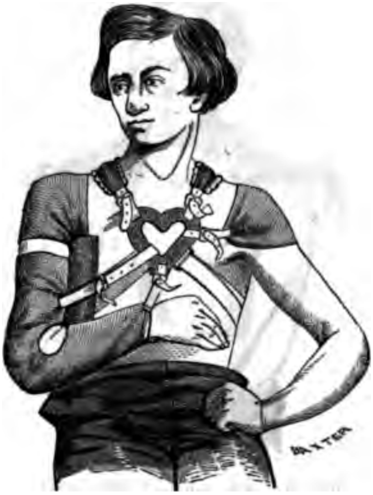
Fig. 10.



Back View of Welch's Apparatus.

A. Vertical or dorsal piece. *b, b.* Lateral or thoracic arms. *c, c.* Oblique or cervical arms. *d, d.* Transverse or acromial arms. *e, e.* Leather shoulder-caps and straps.

Fig. 11.



Front View of Welch's Apparatus.

forwards, conform to the sides of the neck. The whole are well and thickly padded.

The transverse or acromial arms, running parallel with the spine of the scapula to the acromion process, are made of elastic steel, slightly curved backwards at their outer extremities, so that, when the shoulders are made fast to them by the shoulder-straps, they will tend constantly to pull the shoulders outwards and backwards.

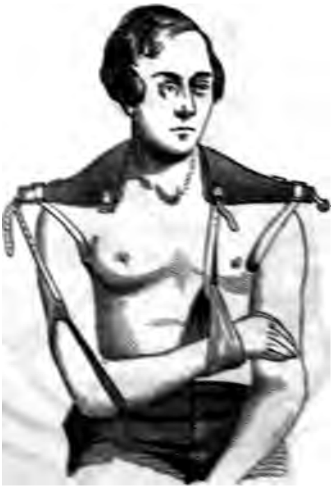
The several parts of the apparatus are adjusted to persons of different sizes.

1st. The cervical arms can be made to approach or to separate from the arch, and they can also be made longer or shorter.

2d. The acromial arms can be lengthened or shortened upon either side, and when in use the arm opposite the broken bone should be longer than the one opposite the sound bone, to give greater freedom to the arm upon this side.

In the front view of the apparatus is seen "a padded metallic ring, the upper edge of which is placed nearly as high as the upper edge of the sternum. Above are straps connecting it with the cervical arms. Laterally is a strap connecting with the shoulder-cap of the sound side, to prevent the central ring from inclining toward the injured side; opposite this is another strap attached also to the sling supporting the arm and drawing the arm of the injured side inwards;" below these are straps connecting with the thoracic arms, and at the inferior point of the ring is a strap designed to support the hand and forearm.

Fig. 12.



Hunter's "Yoke Splint," modified by Day.

sling in which the arm rests has thin strips of metal sewed into t, at the sides of the arm both above and below the elbow, with rings for the straps, in order to give a uniform and unyielding support to the arm the entire length of the sling."

The axillary pad may be made in the usual form, and secured in the ordinary mode.

The inventor claims for this apparatus that it possesses, in common with no other apparatus, the essential and distinguishing feature of accomplishing the three indications through supports resting and depending almost exclusively upon the spine and sternum, and but slightly if at all depending upon the shoulder of the sound side, of whose motions therefore it is entirely independent. He believes that there is no motion of the body which can more than slightly change their relative position.

Fig. 12. *A. Hunton's "yoke splint," modified by Day.—New Jersey Medical Reporter*, vol. v. p. 146, 1852.

DEFORMITIES AFTER FRACTURES.

BY

FRANK HASTINGS HAMILTON.

> "DISTORTION, or ill conformation of the parts, proceeds either from the neglect of the Chirurgeon, when he makes less extension, joining together or binding than he ought to do; or it is the fault of the Patient, when he stirs the broken part before the Callus is grown strong, or stands upon it; or else it is the fault in the fracture."—SCULTETUS.

EXTRACTED FROM THE
TRANSACTIONS OF THE AMERICAN MEDICAL ASSOCIATION.

PART SECOND.

PHILADELPHIA:
T. K. AND P. G. COLLINS, PRINTERS.
1856.

PREFACE.

THE second part of my report on *Deformities after Fractures* includes the consideration of fractures of the scapula, arm, forearm, and hand. It was my original intention to have completed the whole subject in a single paper, but I had then no proper idea of the amount of labor which was before me. Instead of one report, I shall be obliged to make three, for I have not yet considered fractures of the body and lower extremities.

It is so natural for one to overestimate the importance of any work upon which he has been for a time especially engaged, that I distrust my own judgment in reference to the propriety of continuing the report beyond this year; and I beg that you will indicate to me frankly your desires upon this subject. In the mean time, whatever may be your commands, I am preparing to publish, on my own account, a *Treatise on Fractures and Dislocations;* and, as I shall wish to make use of the material which is already contributed by me to your *Transactions*, and which has become your property, I shall be obliged to ask your consent to such a diversion of your rights.

DEFORMITIES AFTER FRACTURES.

CHAPTER VI.

SCAPULA.

The following are the only cases of fracture of this bone which have come under my especial observation. In my visits to hospitals in this country and abroad, I have occasionally seen other examples, three or four of which I can call to mind; but I did not make at the time any careful examination of them, and I am not prepared to record either their history or their results.

Body.

Case 1. *Fracture and union without deformity or maiming.*

Willard Vaname, aged 55, fell on his back upon the sidewalk, breaking the scapula a little below the spine. The soft parts were swollen and tender, and prevented an examination sufficiently accurate to determine whether the fragments were displaced; nor could I ascertain the direction of the fracture. Its existence, however, was rendered certain by an occasional distinct crepitus.

I applied a broad roller about the arm and chest, and directed him to remain quiet a few days. Recovery was complete within three months. No muscular anchylosis.

Acromion Process.

Case 2. *Fracture with ligamentous union. Functions of the arm not impaired.*

Samuel Denon Knight, of Buffalo, aged 28 years, fell into the hold of a vessel, striking upon his head and shoulder. He was for a time insensible. Drs. Flint, Mixer, and myself in attendance. The next day we discovered the fracture of the acromion. It was broken transversely about three-quarters of an inch from the extremity. The fragment was only slightly displaced, and motion, with crepitus, was distinct. He raised his arm to his head with some difficulty.

We adopted no treatment. Six months after the accident, I found him with the perfect use of his arm and shoulder. The fragment was united, but slightly depressed.

Coracoid Process.

CASE 3. *Fracture and no union at the end of three months; complicated with unreduced dislocation of the clavicle at its scapular extremity.*

John Wood, Jr., of Lancaster, Erie County, was struck by a board falling edgewise upon his shoulder, dislocating the acromial end of the clavicle, and at the same moment striking upon and breaking the coracoid process.

The case was treated with a sling, axillary cushion, and roller. At the end of three months and five days, I found the apparatus still applied. The clavicle was uplifted from its socket, and the fragment of the coracoid process could be distinctly felt moving forwards or backwards whenever the humerus was moved in these directions.

Feb'y, 1856. The fragment remains displaced, with the clavicle also, and the functions of the arm are not impaired.

Acromion Process. Cabinet Specimens.

Specimen 1. A boiled specimen, taken from an adult skeleton. The process is separated obliquely, at an angle of 45°, six lines from its extremity, and not united. The adjacent surfaces are smooth and covered with compact tissue, as in pseudo-arthrosis. There is no appearance of ensheathing callus, except a very slight crest along the margin of the fracture. The history of the specimen is not known. (The property of the Wistar and Horner Museum, University of Pennsylvania, Philadelphia.)

Specimen 2. A boiled specimen. Adult. Separated nearly transversely six lines from extremity, and not united. Adjacent surfaces resemble specimen No. 1. History not known. (Wistar and Horner Museum.)

Specimen 3. A scraped specimen. Adult. Separated nearly transversely at about one inch and a quarter from the end. Closely united by ligament, and fragment not displaced. No ensheathing callus. These conditions were noticed before the specimen became dry, at which time there was distinct motion between the fragments. (Museum of the Massachusetts Medical College, Boston. No. 1369.)

Specimen 4. Dried. Adult. Separated in a direction slightly oblique, so that measuring on one side the fragment is twelve lines in length and on the opposite fifteen lines. It is closely united by ligament and without displacement. (Mass. Med. Col. No. 1370.)

Specimen 5. A macerated specimen. Adult. The process is separated about one inch from its end, nearly transversely, and united by ligament without displacement. No ensheathing callus. Between the fragments there was "almost a synovial cavity." (Mass. Med. Col. No. 1371.)

Specimen 6. This is probably the mate of No. 5, and resembles it in all points except that ossification seems to have partly occurred between the fragment and the body of the scapula, but by accidental violence to the specimen, the process has been broken off at or very near the line of ossification. (Mass. Med. Col. No. 1372.)

Specimen 7. Dried specimen from an adult. Separated transversely near its middle, and united by a ligament of about two lines in length. No displacement of the fragment. No ensheathing callus. (Museum of Charles Gibson, Richmond, Va.)

Specimen 8. Dried. Adult. Separation transverse, about one inch and a quarter from the end. Not united. (Charles Gibson.)

Specimen 9. Adult male, æt. 40, a stout laborer. He was struck by a "powder blast," breaking at the same time his humerus, the lower jaw, and the base of the skull. The periosteum was not broken upon its upper surface, so that no displacement occurred. The fragment could be turned up and back as on a hinge. The patient survived the accident three weeks. (Stephen Smith, one of the Surgeons to Bellevue Hosp., N. Y.)

Coracoid Process. Cabinet Specimens.

Specimen 1. Separated one inch from extremity. Line of separation somewhat irregular. No callus. Fragment suspended by a dried tissue continuous with the periosteum. The acromion process has not yet become united by bone. The scapula is large, and evidently belongs to an adult. (John Neill, Philadelphia.)

Specimen 2. A dried specimen. Adult. Broken obliquely near the end. United by ligamentous or fibrous tissue, of one line and a half in length, in a manner similar to specimen No. 1. The fragment is displaced a little forwards, as well as downwards. (Charles Gibson, Richmond, Va.)

Specimen 3. This is a dislocation of the head of the humerus forwards under the clavicle with fracture of the coracoid process. The head and neck of the humerus lay against the thoracic surface of the neck and belly of the scapula, and are firmly united to the scapula by an abundant ossific deposit. (Reuben D. Mussey, Cincinnati, Ohio.)

Specimen 4. "No. 453, labelled 'Fracture of coracoid process,' and whether by Dr. Warren, the founder of the museum, or by some former owner of the specimen, I cannot say; its history being unknown. There is a fracture not merely of the entire process from the body of the bone, but it encroaches somewhat upon the body and the glenoid cavity. The fracture was quite recent, as it would appear from an examination of the fractured surface generally, and also from the edges, where it encroaches upon the glenoid cavity. Commencing near the margin of this fracture, and extending outwards upon the scapula, there appears evidently to have been an old fracture, which has united by bone. This fracture extends horizontally along the body of the bone for nearly two inches, then turns upwards at a right angle and extends about two-thirds of an inch in that direction. Upon the inner surface, the line of the old fracture does not quite reach the recent one apparently, though I presume that it extended rather further in that direction in the recent state than it appears to now. Upon this inner surface no new bone is thrown out along the line of the fracture; but, on the other hand, this line is for the most part indicated by a very narrow and superficial groove. Upon the outer or dorsal surface, there is a deposit of new bone along the line of the fracture, quite small in amount; but, on approaching the neck of the bone, this deposit increases very considerably in amount, and becomes quite irregular. On examination of the detached coracoid process itself, there is distinct evidence of an old fracture that must have involved its very base towards the body of the bone, the surface adjacent to the fracture being rough from inflammatory deposit. I have given these details because it is a complicated case; and, to give a general idea of it, as it appears to me, I should say that there might have been a fracture of the bone some time within a year before the death of the individual—a fracture involving the base of the coracoid process; this fracture had united by bone, and just before death the whole process had been broken off, and so completely as to involve to a small extent the glenoid cavity." (Mass. Med. Col.; reported by J. B. S. Jackson, Boston.)

REMARKS.

Fractures of the scapula are exceedingly rare, and the observations recorded by myself are too few to enable me to draw any valuable conclusions. I have sought, therefore, to supply in some measure, the deficiency in this portion of my report by describing briefly such specimens of these fractures as may be found in my own collection, or in the collections of other American surgeons.

Cabinet specimens of fractures of the body and angle of the scapula being more frequently met with than specimens of fractures of either of the processes, or of the neck, I have omitted to collect and record them. I have, however, furnished the following epitome of the opinions and practice of surgeons, relating to these latter accidents, as a *résumé* of what is at present known of them, both in relation to prognosis and treatment; a mode of considering this subject which, although it might scarcely be admissible in a systematic treatise, seems to me not inappropriate in a report, the object of which is rather to collect from every source facts, opinions and references, which others may hereafter render available.

If the scapula "be broke in several pieces which are not likely to unite, incision is to be made, and the loose pieces are to be taken out, leaving the rest to nature." "If the scapula be broke near the joint, it is for the most part incurable." (*System of Chirurgery*, by Richard Boulton, p. 324. London, 1713.)

Where the patient is not so fat or so muscular as to render it impracticable, the fingers must be thrust underneath, so as to elevate the depressed fragments, "which having replaced, with suitable bolstering and deligation, you are, as much as possible, to keep it up." A careful regimen is to be enjoined, with rest and proper therapeutics, "and when he has done this, as becomes him, I see not any injustice that he should be paid for a cure, in which, if the work succeed, *Nature* rather than *Art* had the chiefest hand." (*Art of Surgery*, by Daniel Turner, vol. ii. p. 260. London ed., 1742.)

Elevate the head and shoulders, to relax the muscles of the back, and at the same time support the humerus so as to relax the deltoid. Retain the arm and shoulder in this position by suitable rollers. (*System of Surgery*, by Benjamin Bell, p. 478. 3d Philad'a ed., 1806.)

When the body is broken, "it is merely necessary to fix the arm to the side by means of a bandage, which includes the arm from the shoulder to the elbow." When the inferior angle is broken off the arm is to be pushed "inward, downward, and forward, where it is to be kept by a roller. The fragment is also to be kept backward as much as possible, with compresses and a roller. The arm is to be supported in a sling." (*On Fractures*, by Joseph Amesbury, vol. ii. p. 534. London ed., 1831.)

"It is sufficient to restrain motion; and this is effected by passing a bandage round the chest, over the scapula, and round the arm." (*Elements of Surgery*, by Robert Liston, p. 470. Philad'a ed., 1837.)

The elbow is to be lifted by a sling, and the arm and body are to be swathed with a broad roller. If the lower portion is disposed to become displaced, it may be supported by a pad. "It is seldom, however, that much advantage can be gained by this." * * * "Little harm results if the fractured portions unite in the position into which they are driven at the time of the accident. * * * The free use of the shoulder-joint, however, is not recovered till some time after." (*Treatise on Fractures*, by Edward F. Lonsdale, p. 191. London ed., 1838.)

"When the lower angle of the scapula is broken off the humerus may be brought forward across the chest, and the hand confined upon the opposite shoulder." "This position is adopted abroad; but, in this country, when any part of the body of the scapula is fractured, we merely apply the spica bandage." Mr. Cooper regards this bandage as "of little or no use," and speaks of the sling which is employed with it, as "the efficient part of the apparatus." (*First Lines of Surgery*, by Samuel Cooper, vol. ii. p. 327. New York ed., 1844.)

A simple roller to keep the arm against the body, and a sling. (*Note to Chelius*, p. 602.)

A sling, with a bandage to confine the arm to the body, or with Desault's apparatus. (*Operative Surgery*, by Frederick C. Skey, p. 157. Philad'a ed., 1851.)

When the dorsum is broken Mr. B. Cooper employs a long roller which is made to cover the arm and secure it to the chest; but when the fracture is at the inferior angle, he recommends that the arm be carried across the chest. (*Surgery*, by Bransby B. Cooper, p. 227. Philad'a ed., 1852.)

"A body bandage." (*Surgery*, by John Erichsen, p. 206. Amer. ed., 1854.)

"A broad flannel bandage, or riding belt, should be put around the body, and the arm bound to the side." "It is with difficulty retained *in situ*." (*Practical Surgery*, by John Lizars, p. 132. 2d Edinburgh ed., 1847.)

"It is sufficient to restrain motion, by wearing the arm in a sling, and by having a broad flannel bandage passed tightly over the chest, including the fractured bone." (*Practice of Surgery*, by James Miller, p. 311. Philad'a ed., 1853.)

When the angle is broken off, or even though the fracture be considerably above the angle, if it is complete and transverse, it will be necessary to place one compress in front of the lower fragment, and one behind the upper, and then having pressed the arm downward, forward, and inward, to secure it with a roller, &c. If the body is broken otherwise, it will be sufficient to put the arm in a sling and to secure the arm to the body with a roller. (*System of Surgery*, by William Pirrie, p. 146. Philad'a ed., 1852.)

Gorter recommends in all fractures, whether of the body, processes, or neck, that in order to accomplish the reduction, the elbow shall be carried from the body to relax the deltoid, and that the arm be then suspended and kept at rest in a sling. "*In restitutione attollendum brachium, ut Deltoides musculus sit laxus, dum digitis Chirurgi reponatur fractura. Post repositionem diu non debet aeger conari elevare brachium, sed gerere debet brachium mitella admodum sustentatum.*" (*Chirurgia Repurgata, auc. Johannis de Gorter.* Lugduni Batavorum, p. 80. 1742.)

Confinement of the arm to the side of the body, with a conical pad in the axilla, the apex of which should correspond to the axilla; the elbow lifted by a sling, or bandage, or both; a figure of 8 bandage upon the shoulder. Where the fracture is transverse and considerably above the angle, the hand may rest, if the patient can endure it, upon the sound shoulder. "If the fracture is near the angle, the cure is always effected with some deformity; but which does not interfere with the motions of the arm." (*Chelius' Surgery*, vol. i. p. 601. American ed., 1847.)

In fractures of the body apply a simple bandage to confine the arm to the side of the body. In fractures of the angle the upper fragment is to be carried backward and downward by bringing the elbow forward and upward; and the whole is to be secured by a long roller. (*Operative Surgery*, by A. Tavernier, p. 378. Philad'a ed., 1829.)

Rejecting all the complicated forms of apparatus, which he believes to have been proved inefficient, M. Nélaton remarks: "In truth we are forced to acknowledge that we have not any means to act upon the fragments; all that we can do is to maintain their immobility, and upon this occasion *I will repeat what I said when treating of fractures of the clavicle; all our retentive means being equally insufficient, the best will be that which will cause the least pain;* a simple sling, which will embrace the elbow, the arm, and the forearm, will then suffice. I must, however, give the preference to the bandage of M. Mayor, because it maintains the shoulder more firm." (*Elémens de Pathologie Chirurgicale*, par M. Nélaton, tom. premier, p. 723. Paris ed., 1844.)

Mayor employs the same apparatus which is recommended by him for fractured or dislocated clavicle, namely, a sling with two broad shoulder-straps, which are made to rest respectively upon the two shoulders; the elbow being carried forward across the body. (*Nouveau Système de Deligation Chirurgicale*, par Matthias Mayor de Lausanne. Troisième éd., p. 396. Paris, 1838.) See also Figs. 23 and 24, Plate 3.

"With all these precautions we can easily determine the existence of a fracture; but to know whether it is transverse or oblique, simple or multiple, is another thing. Often, indeed, when the displacement is nothing, or very inconsiderable, crepitation will declare a fracture to which the touch cannot assign its place; and, finally, a fracture without displacement, and without crepitation, will be almost inevitably unrecognized.

"It is fortunate, then, that in these cases the mistake is without importance, and the prognosis is scarcely more grave in fractures which are accompanied with the most striking displacement. B. Bell affirms that they determine, very frequently, in the movements of the arm a permanent stiffness;[1] but for myself, I have seen nothing of this kind, and I have not even remarked an appreciable constraint in the movements with the subjects whom I have seen.

" Fractures without displacement require nothing but repose, and it is sufficient to hold the arm snug against the trunk with a body-bandage and a sling.

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[1] "It is always difficult to cure, and induces commonly a permanently stiff and unwieldy state of the corresponding arm."—*System of Surgery*, by Benjamin Bell, p. 478, 3d Philad'a ed.

"When there exists displacement, the reduction has been effected in various ways. Pierre d'Argelata places a ball under the arm and brings again the elbow against the ribs. J. L. Petit directed that the arm of the patient should be lifted until the fold of the elbow was opposite the nose; and, while an assistant maintained it in this position, the surgeon should adjust the fragments as well as possible. B. Bell recommended to elevate the head and the shoulders to relax the muscles of the back. Heister drew the arm forward;[1] Desault, for fractures of the inferior angle, carried the arm before the chest, holding it a little removed from the body, while the hand of the injured side was placed upon the extremity of the sound shoulder.[2]

"Surgeons are not much better agreed as to the apparel to be employed. Paulus of Ægineta treated these fractures as those of the clavicle, recommending that the patient should be kept reclining upon the sound side. Albucasis applied upon the scapula a sort of *etoupade*, above which again are placed compresses, and splints of wood or of leather. Desault employed a wedge-shaped cushion, of which the apex corresponded to the axilla, and the base to the chest, in order to furnish a *point d'appui* for the arm; the whole supported by a bandage six or seven ells in length, of which the first turn was intended to fix the hand of the injured side upon the sound shoulder. Boyer,[3] without having any regard to the displacement, occupied himself in maintaining the immobility of the bone; and, therefore, by appropriate turns of the bandage he secured the arm closely to the side of the body, carrying the elbow at the same time a little forward.

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[1] Heister adds, moreover, that we ought to apply proper compresses and slips of pasteboard wet "*cum spiritu vini vel oxycrato*," and firmly bound on with the stellate or four-headed bandage.—*Institutiones Chirurgical de D. Laurentii Hiesteri.* Pars Prima, p. 94. Ed. Amstelaedami, 1739.

[2] Treatise on Fractures, Luxations, &c., by P. J. Desault, p. 64. Philad'a ed., 1805.

[3] For vertical fractures, or transverse and through any part considerably above the lower angle, Desault's apparatus without the axillary cushion. To place the hand upon the opposite shoulder, is, however, "unnatural and fatiguing." In fracture of the inferior angle, "the arm is to be pushed inward, downward and forward, the forearm being half bent." The arm is to be retained in this position by a body-bandage, seven yards long; the lower fragment is to be supported by a compress and an additional roller, with a sling.—*Boyer on the Bones*, p. 70. Philad'a ed., 1805.

"Among such a diversity of practice, which shall the surgeon choose? Shall he attempt the reduction, and have we the means to accomplish it?

"The three indications to fulfil will be to carry the inferior fragment backward and inward, the superior forward and outward, and lastly, to correct the overriding. The inferior fragment seems to be drawn away by the teres major; it is necessary, then, in order to relax this muscle, to approach the arm to the trunk, and even to incline it a little backward. The superior fragment appears to be under the predominating influence of the rhomboid, which is relaxed by carrying the shoulder upward and backward. But as to the overriding, I do not see any means by which it can be overcome.

"Position alone will not suffice to correct the two first displacements; it will be found necessary to employ also adjustment with the hands, and further, the retentive apparatus must combine at the same time: *First*, means capable of holding the shoulder upward and backward, with the elbow near the body; and upon this point the reader may consult what we have said upon the subject of this indication when speaking of fractures of the clavicle. *Second*, of means suitable to replace the pressure of the hands—a compress upon the superior fragment, to press it forward against the other—graduated compresses beneath the same to hold it outward, and upon the outer side of the inferior fragment to hold it inward.

"Such, at least, are the means which a study of the actual displacements, and their most probable explanations, would seem to indicate; but here, as in many other cases, nature makes light of our theories; and for myself I confess that in the few fractures of this kind that I have had occasion to treat, I have not been able, by any of the means which I have indicated, to reduce the displacements, much less to maintain the reduction. Indeed, I must say that the positions which seem the most rational, sometimes increased the displacement, which was again diminished by other attitudes, variable for each subject. If, then, a surgeon shall ask advice with regard to the reduction, the only course which experience authorizes me to give to him, will be to try every possible attitude, until he has found the best, and then to maintain this position as long as may be necessary for consolidation.

"But in the major part of these fractures, such excessive care is not demanded; and in others, the reduction, often so impossible to accomplish, is of no very great importance, and I content myself with holding the arm up with an ordinary sling, while it is kept snugly against the trunk with a body-bandage." (*Traité des Fractures et des Luxations*, par L. F. Malgaigne. Paris ed., tom. i. pp. 503–5.)

In cases of fracture of the lower angle, a thick compress is to be placed in front of the lower fragment, and there retained by an additional roller or a sling. * * * "It is hardly possible to restore the fragment to its former position." * * * Yet "they may be made to approximate so closely as to leave little or no deformity." "Sometimes the patient recovers sooner when confined to bed during the whole treatment." (*Surgery*, by Wm. Gibson, vol. i. p. 278. Philad'a ed., 1841.)

A broad compress and a wide roller around the chest, with the arm in a sling and confined to the body. If the inferior angle is broken, the arm should be carried backwards, and confined by a broad roller with compresses, so applied as to support both fragments of the scapula. The whole arm is to be sustained by a sling. (*Minor Surgery*, by F. W. Sargent, p. 153. Philad'a ed., 1848.)

In addition to the remarks made by these various writers, I find it only necessary to say that occasionally these accidents are so severe as to determine suppuration, and even necrosis of the bone, requiring, therefore, more or less deviation from the rules of treatment which have been suggested.

I have been unable to find any other example of incomplete fracture of the scapula than the one mentioned by M. Malgaigne. I have, therefore, had executed upon stone, a drawing of a specimen contained in my own cabinet (Pl. 1, Fig. 1). The bone was presented to me by Dr. N. C. Powers, of Syracuse, and belongs to the skeleton of the Oneida Indian, "Nimham," who was a great fighter, and who died when about 45 years old, in consequence of severe injuries received in a street brawl; but his death did not occur until four or five months after the receipt of the injuries.

In addition to this fracture of the right scapula, five of his ribs were broken, and both legs, all of which, except the scapula, had united completely by intermediate and ensheathing callus. He was under the care of Dr. Morrison, of Oneida Castle.

The lithograph has been drawn with great fidelity, by Charles E. Lewis, lithographer, of this city.

The scapula (see engraving) is broken nearly transversely, commencing upon the posterior margin at a point about three-quarters of an inch below the spine, and extending across the body of the bone one inch and three-quarters, in a direction inclining a little upward, irregularly denticulate and without comminution. The fragments are in exact apposition, and, throughout most of their extent, in immediate contact. They are, however, not consolidated at any point, but upon either side of the fissure there is a ridge of ensheathing callus, of from one to three or four lines in breadth, and of half a line or less in thickness along the broken margin, from which point it subsides gradually to the level of the sound bone. The same is observed upon the inner as well as upon the outer surface of the scapula. This callus has assumed the character of complete bone, but it is more light and spongy than the natural tissue, and the outer surface has not yet become lamellated. Its blood-canals and bone-cells open everywhere upon the surface.

Directly over the fracture, and between its opposing edges, no callus exists, but as the bone had lain some time in the earth before it was exhumed, it is probable that a less completely organized intermediate callus had occupied this space, and that, owing to the less proportion of earthy matter which it contained, it had become decomposed and had been removed.

One may notice here: *First*, the existence of true ensheathing callus in a flat bone; *second*, its presence where there could have been no motion of the opposing fragments, and consequently no *necessity* for a "provisional splint."

If by fracture of the "neck of the scapula" is meant a fracture which detaches the glenoid cavity from the body of the bone, it is certainly very rare, and, indeed, its existence is doubted by Sir Astley Cooper, South, Erichsen, and others. Mr. South says there is no such specimen in any of the museums in London. Dr. Mott has said to me, also, that he has never seen a specimen, and that in the normal state of the bone he regards its occurrence as utterly impossible. Such, I confess, is my own conviction. If, however, it is intended, in speaking of fractures of the "neck of the scapula," to refer only to fractures extending through the semilunar notch, behind the root of the coracoid process, and this ought to be regarded as the only appropriate use of the term, then its existence is certain, yet the fracture is not common. Duverney has reported one case, the condition of which he proved by an autopsy. The coracoid process was broken at the same time, but the fracture through the neck of the scapula was distinct from this.[1]

I am told, also, that Dr. Mott has in his possession a scapula which appears to have been broken through its neck, and behind the root of the coracoid process, and which has united with very little displacement.

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[1] Traité des Fractures, etc., par J. F. Malgaigne. Tom. I. p. 512.

Mr. Fergusson has given in his book a picture representing a fracture through both of the lines which we have described, but it is a mere "fancy sketch," and ought never to have been permitted to disfigure so excellent a treatise.

Examples of fracture of the acromion process have been reported by Duverney, Bichat, Avrard, A. Cooper, Desault, Sanson, Nélaton, Malgaigne, Brainard,[1] and others.

In the case mentioned by Cooper, it entered the articulation of the clavicle, and produced, at the same moment, a dislocation. Malgaigne says it occurs generally further up, and beyond the articulation, "*near the junction of the diaphysis with the epiphysis.*" "It generally breaks at right angles and vertically," but in Nélaton's case it was oblique.

There is some reason to believe, I think, that a true fracture of the acromion process is much more rare than surgeons have supposed, and that in a considerable number of the cases reported there was merely a separation of the epiphysis; the bony union having never been completed. If such fractures or separations occurred in children, very little doubt could exist as to the nature of the accident generally, but the specimens found in museums, and the cases reported in the books have been mostly from adults. It is more difficult, therefore, to suppose these to be examples of separations of epiphyses, but I am inclined to think that in a majority of instances such is the fact. It is very probable, also, that in the case of many of the specimens found in the museums, the history of which is unknown, they were united by only cartilage until, in the process of boiling or maceration, the epiphysis became separated; and being found in this condition, they have been mistaken for fractures.

This supposition may explain the almost constant absence of displacement, and of ensheathing callus (except a narrow crest mentioned by Malgaigne, the character of which must be doubtful. Indeed, it seems to me more like the crest upon which a fibro-ligamentous capsule or periosteum has been attached).

In order to a better understanding of certain peculiarities of this fracture I shall quote from Malgaigne, who speaks more at length upon this subject than any other writer known to me; but to whom the probability of a disjunction of an epiphysis being mistaken for a fracture, does not seem to have occurred.

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[1] Case of supposed fracture; and prosecution of the surgeon for alleged malpractice.—*Bost. Med. Journ.*, vol. xxxi. p. 501. Also, *Illinois Med. Journ.*, 1845.

"The prognosis given by authors is very contradictory. Heister and Boyer regard it as impossible to obtain an exact union, and without deformity; but while the first believes that the elevation of the arm will always remain constrained, the second teaches that a slight deformity does not in any degree compromit the movements and the strength of the member" (p. 509). "And, in fact, with Desault's patient, all constraint had disappeared at the 48th day. M. Sanson has even obtained a cure as complete in 30 days, in a case more difficult; the acromion having been divided by a sabre-cut" (p. 509).

"A. Cooper has noticed another danger; bony callus, according to him, is rare in these fractures, and there results generally a false joint (*pseudo-arthrose*). He reports a case of this kind. MM. Nélaton and Avrard have each seen another, and the bony callus is equally wanting in the pieces represented in vol. iv., Figs. 1, 2, and 4, and upon another piece in the Dupuytren Museum. Perhaps in these different cases we ought to accuse generally the bad complications, or the indocility of the patients; in fact, in the observation of Bichat, the consolidation was completed on the 32d day. One of the patients of M. Avrard having thrown off the bandages on the 10th day, recovered with a complete union. I have myself seen an example in which it was impossible by the touch to discover the place of the fracture. I think that we ought to establish a distinction between fractures without displacement and almost without rupture of the periosteum, and those which are not thus conditioned; yet even here the treatment employed, and the docility of the patient, no doubt, do much towards the result.

"When bony callus is not formed, A. Cooper says that the fragments unite by a fibrous tissue. I have verified this mode of union upon the pieces represented in Figs. 1 and 2; but upon that represented in Fig. 4, the fractured surfaces appear eburnated, as if they had rubbed one against the other, and I readily incline to believe that there had existed here a joint.

"However this may be, it has happened to me to notice on all the pieces that I have seen, that the superior borders of the fracture are surmounted with little bony crests, of a recent formation, and of which the largest part pertains to the scapular fragment (see especially Fig. 4), as if the work of ossification was more active on this side, and the detached extremity of the acromion possessed a less degree of vitality. But another specimen in the Dupuytren Museum presents a strange phenomenon, which obliges us to modify this conclusion.

"The external fragment has a diameter almost double that of the other, so that while the upper surface is level, the lower surface projects considerably; and it has thus led the person who made the catalogue into the error of supposing that the fragments were overlapped. It is, however, a hypertrophy of the detached fragment, a phenomenon which has not, to my knowledge, been heretofore noticed, and which we shall again meet with in other fractures." (*Traité des Fractures et des Luxations*, tom. i. pp. 509–10.)

Of the nine specimens reported to me, only one specimen seems to have been beyond doubt a fracture. The first six are pretty certainly only separations of the epiphyses. Of the specimens 1 and 2, belonging to the Wistar and Horner Museum, Dr. Henry H. Smith remarks, that they were found in the dissecting-room, and in his opinion such specimens are not rare, and that they "are rather separations of the epiphyses than fractures, yet the surfaces of each portion are closed by compact bony tissue."

Dr. J. B. S. Jackson, of Boston, to whom I am indebted for much valuable information pertaining both to the Museum of the Mass. Med. Col. and to the museum of the "Soc. for Med. Improvement," alluding to the specimens Nos. 3, 4, 5, and 6, speaks as follows:—

"Of fractures of the acromion process we have, I believe, none; but we have four specimens that might be well mistaken for this accident, and in regard to which I have a few words to say.

"The acromion process ossifies in two pieces, which subsequently unite, and finally co-ossify with the bone itself. Now, three of the specimens referred to, show, I believe, a non-union of this process. The fourth specimen, which was the fifth in order that was met with, was found among some loose bones at the Med. College, and was at first thought to be a case of old fracture united by bone; from the circumstance, however, of the incomplete union of the epiphysis at the lower angle and along the base of the bone, I was subsequently led to think that the union of the acromial epiphysis as it may be called, might have recently occurred; the bony union was strong and complete, but the line of division between the epiphysis and the bone itself, was quite marked. Not long after this scapula was found, there was found a second at the College (No. 5), and I think not far from the first; and it was evidently its mate, judging from the size, form, color, and degree of ossification. The acromion process, however, was in this specimen wanting. I presumed that it was not fully ossified, and, being ununited, was separated and lost when the bones were macerated. I should say that in the museum of our Medical College are several collections of bones, from as many different subjects apparently, and it would not therefore be unreasonable to regard these two scapulæ as mates. Last winter, Dr. Hodges, our demonstrator, found in a dissecting-room subject, and one that he thinks must have been at least forty years old, the acromial process of each scapula fully formed, but having no bony union whatever with the bone itself. The union was ligamentous, but strong and close, yet Dr. H. thinks that in one of the specimens there was almost a synovial cavity. I am not aware that this non-union of the acromial process in the adult subject has ever been described, though I should think that it must have been. It is obvious, however, that such a mistake as has been above referred to might very well be made."

Mr. Lizars has remarked that "in some individuals the acromial process continues an epiphysis during life," and Mr. Fergusson says "the acromion may be broken, but the accident is of rare occurrence." * * * "I have dissected a number of examples of apparent fracture of the end of this process; but in such instances it is doubtful if the movable portion had ever been fixed to the rest of the bone."

In addition to the specimens which I have already mentioned, of epiphyseal disjunctions, it has occurred to me to see the same in a number of instances, and in nearly every instance I have noticed the existence of a more or less compact tissue between the adjacent surfaces, and of a slight rising along the margins of the fragments.

I am surprised that Mr. Lizars should have never seen a case, nor heard of a well authenticated example of fracture of the coracoid process. "The coracoid process," he remarks, "is said to be broken off, but this I question very much; it must be along with the glenoid cavity, or there must be fracture of the neck of the scapula."[1]

Three of the specimens recorded by me are fractures of the coracoid process simply, and in only one case is the glenoid cavity at all implicated; nor even here is there a fracture of the "neck of the scapula," nor is the "glenoid cavity" borne along with the process. One example occurred in the practice of Mr. Arnott, at the Middlesex Hospital, London; in consequence of which the patient died, and an autopsy disclosed the true nature of the accident.[1] Mr. South has reported, also, in the *Lond. Med.-Chir. Rev.*, for 1840,[2] a case complicated with partial forward dislocation of the humerus, fracture of the clavicle, acromion process, and of the olecranon process. The patient died on the fourth day, and Mr. South has published the result of the autopsy. He confesses frankly, also, that neither the fracture of the clavicle, nor of the coracoid process was discovered before death. Erichsen says there is in the museum of the University College, a preparation showing a fracture of the base of this process, implicating and extending across (not *behind*) the glenoid cavity.[3] Duverney examined after death a patient who had a fracture of this process, and also a fracture of the neck of the scapula.[4] Boyer also examined one after death, and Malgaigne has seen two, of one of which he furnishes a drawing.[5]

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[1] System of Practical Surgery, by John Lizars. Edinburgh, 1847. p. 132.

In addition to these actual specimens, several cases have been reported by gentlemen of unquestioned authority. The accident is certainly not common, and in a majority of instances where it is known to have occurred, the concomitant injuries have been so great that the patients have died.

In specimens 1 and 2, belonging respectively to Drs. Neill and Gibson, the fragments are suspended by a ligament, and in specimen 4, belonging to the Mass. Med. Col. Museum, and reported to me by Dr. Jackson, the process, broken at its base, had evidently united by bone.

Of the treatment of fractures of the coracoid, or of the acromion process, I have only one general observation to make. It is very obvious that in neither of these fractures can anything be accomplished by splints, and probably quite as little by position. All that the surgeon can do is to enjoin rest, and, if necessary, to enforce it by suitable bandages, and to control inflammation.

If the neck of the scapula is broken, whether the fracture be simple or comminuted, the rational indication seems to be to place a moderate compress in the axilla, and having disposed the arm in a sling, to secure the elbow snugly against the side of the body.

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[1] Fergusson's Surg., p. 213.

[2] Vol. xxxii. New Series, pp. 41 and 2.

[3] Science and Art of Surgery, by John Erichsen, p. 207.

[4] Traité des Fractures, etc., p. 512.

[5] Ibid., 512.

CHAPTER VII.

HUMERUS.

Upper Third.

Separation of Epiphysis.

CASE 1. *Separation of upper epiphysis. Non-union.*

Mike Bovin, son of Peter B., cor. Washington and Tupper Sts., Buffalo, æt. 13 months, fell sideways from a cradle, about the 20th of Nov. 1855, striking upon his left shoulder.

He was taken to a German empiric, who called it a sprain, and applied liniments. Three weeks after the accident he was brought to me, and I found the arm hanging beside the body, with little or no power, on the part of the little patient, to move it. There was a slight depression under the acromion process, and considerable tenderness about the joint. The shoulder was not swollen, nor had it been at any time.

On moving the elbow backwards and forwards, the upper end of the lower fragment moved in the opposite directions with great freedom, and accompanied with a slight sound, a sound not like the grating of broken fragments, but less rough. The freedom of motion was such between the fragments, that it would almost lead one to suppose that it was the head of the bone playing backwards and forwards in an elongated capsule. There was no overlapping or tendency to displacement. Bringing the elbow a little forward, secured apparently, complete coaptation of the fragments, and of this I judged by the restoration of the line of the bone towards the socket, and by the disappearance of the depression under the process, for the head of the bone could not at any time be felt.

Five months after the injury was received, the fragments had not united, and the child was still unable to lift the arm, although the forearm and hand retained their usual strength and freedom of motions. The same crepitus could occasionally be detected in the shoulder-joint, and the same preternatural mobility. The shoulder was neither swollen nor tender.

Surgical Neck.

CASE 2. *Simple fracture; never displaced. Union without deformity, and treated without apparatus.*

Brisbane, of Batavia, æt. 65. Mr. B. fell through the trap-door of the Eagle Street Theatre, striking upon the axilla of the right arm.

Dr. Sprague, of Buffalo, was called, and after examination pronounced it a fracture of the surgical neck of the humerus. At Dr. Sprague's request, I examined it, also, within an hour after the accident. Crepitus was easily discovered, which, with motion at the seat of fracture, seemed to render the diagnosis certain. There was, however, no perceptible displacement. We concurred entirely as to the nature of the accident, and dressed the arm with splints, rollers, &c. We subsequently learned that all dressings were removed at the end of the first week, and that they were not reapplied, his family physician believing that the bone was not broken. No deformity ensued.

The examination made by Dr. S. and myself at the time of the accident, was careful and satisfactory, and we have seen nothing in the result to change our convictions.

CASE 3. *Simple fracture; never displaced. Union without deformity.*

Alexander Balentine, æt. 62; admitted to the hospital, Dec. 19, 1851. He had fallen upon the sidewalk, striking upon his right arm. Dr. Johnson, of Buffalo, had reduced the fracture, and applied appropriate dressings. No union of the fragments had yet occurred, but as the surfaces were in apposition, it was only after considerable manipulation, and not until we bent the forearm upon the arm, and rotated the humerus by means of the forearm, that the crepitus became distinct, and gave unequivocal evidence of the existence of a fracture, and of its situation.

The treatment, after admission, consisted in the application of one gutta-percha splint, accurately moulded, and extending from above the shoulder to below the elbow, and encircling one-half of the circumference of the arm. The splint being secured with the usual bandages, &c.

The result is a perfect limb.

CASE 4. *Simple fracture. Union with displacement and deformity.* White, of Buffalo, æt. 12, fell 14 feet, striking on the front and outside of the left shoulder. Dr. P., of Erie Co., saw the lad within three hours (July 19th, 1853). He was brought to me on the 4th day after the accident. The upper part of the arm was then very much swollen. I found the arm dressed as for a fracture of the middle or lower third of the humerus. It was shortened one inch. The elbow was inclined backwards, and there was a remarkable projection in front of the joint, feeling like the head of the bone. The hand and arm were powerless. I suspected a dislocation of the head of the humerus forwards; and having administered chloroform, I attempted its reduction with my heel in the axilla. While making extension I felt a sudden sensation, like the slipping of the bone into its socket, but on examination I found the projection continued as before. I then repeated the effort, and with precisely the same result.

I now applied an arm sling, and directed leeches and cold evaporating lotions.

On the 25th, five days after the accident, it was examined by Drs. Mixer, McGregor, Joseph Smith, with myself. We still believed it was a dislocation, and having administered chloroform, we again attempted its reduction. The same *slipping* sensation was produced as before, and the deformity was repeatedly made to disappear; but on suspending the extension, it as often reappeared.

The character of the accident was now made apparent, and we proceeded at once to apply the splint and bandages suitable for a fracture of the surgical neck of the humerus, namely, a gutta-percha splint, extending on the outside, from the top of the shoulder to below the elbow, with an arm and body roller, secured with flour paste.

On the 31st, twelve days after the accident, Dr. Wilcox, marine surgeon at Buffalo, saw the arm with me. The fragments were displaced, the same as when I first saw it, and the same as when no apparatus was applied. We examined it again carefully and attempted to make the fragments remain in place, but we were unable to do so, except while holding them, and making extension.

August 9th (21st day), Dr. Bowen, Prof. of Anat. in Geneva Medical College, being present, I removed all the dressings. Motion between the fragments had ceased, but the projection and shortening remained as before; now, also, the irregular projections of the fractured bones were more distinctly felt.

The dressings were never reapplied. Three months later no change had occurred. He could carry the elbow forwards freely, as well as backwards, the motions of the shoulder-joint being unimpaired.

CASE 5. *Simple fracture, with displacement; resulting in deformity and non-union.*

L. Brown, of Lockport, æt. 43, was thrown from his horse in Feb. 1854, striking upon his right elbow.

Dr. Maxwell, an experienced surgeon of Lockport, examined and dressed the fracture. Dr. Fasset was present, and assisted at a subsequent dressing. Three surgeons who examined the arm before Dr. M., called it a dislocation.

Twelve weeks after the accident, Mr. B. called upon me. The right arm was shortened one inch; the elbow hung slightly from the body; the upper end of the lower fragment was distinctly felt in front of the shoulder-joint under the clavicle, feeling very much like the head of the bone. The fragments were not united, but they could be seized easily, and made to move separately and freely. He stated to me that he was subject to rheumatism, and especially in the shoulder and arm of the side injured. He wished to know whether it could not be "re-set."

Two years after, I was informed by Dr. Maxwell that the bone was still ununited. He was, however, able to write with that hand, having first lifted this arm with the other hand, and laid it upon the table. He says the upper end of the lower fragment is in the axilla.

CASE 6. *Simple fracture; probably impacted; resulting in deformity.*

Wm. Adams, of Buffalo, æt. 15, fell backwards, June 4, 1855, striking on his back and left shoulder. Dr. L. saw it immediately, and regarding it as a dislocation, attempted its reduction. He subsequently repeated the attempt. I saw the patient, with Dr. L., on the 10th day. The arm was shortened one inch and a half. The fragments were displaced forwards, and prominent in front of, and a little below the joint. As in Case No. 4, it might easily be mistaken for the head of the bone; but the difficulty of diagnosis had been very much lessened by the subsidence of the swelling. There was no motion between the fragments; nor could the deformity by any manipulation, or extension, be made to disappear. It was probably impacted.

March 23, 1856, nearly ten months after the accident, I found the fragments remaining as when I first examined it, and the arm shortened one and a half inches. The elbow hung a very little back from the line of the body. The upper end of the lower fragment was lifted to within one inch of the head of the humerus; the upper fragment having its head in the socket, with its lower end directed forwards and downwards. The arm was, however, in every respect as useful as before it was broken. It was equally strong, and he could raise his arm as high, and move it in every direction as freely as he could the other.

CASE 7. *Supposed dislocation of the right humerus forwards, with a fracture of the same bone at its surgical neck; also a dislocation of the thumb and middle finger of the same arm, with a dislocation of the opposite shoulder. Union of the fracture without deformity.* (See *Transactions of the N. Y. State Med. Society*, 1856, p. 44.)

Michael Crichton, of Buffalo, æt. 30. A laborer. These injuries, with several lesser injuries, were received in consequence of being caught in the machinery of an elevator. All of them, except the dislocation of the right arm, were treated by Dr. Sprague, before admission to the hospital. The patient having already suffered considerably, in the reduction of the dislocations and in the dressing of wounds, and being much exhausted, the treatment of the shoulder and arm was referred to me, by a note from Dr. Sprague, with a suggestion to defer this until after the patient should have become rested. I saw Crichton in his ward on the next day after the accident, and found a fracture of the left humerus through its surgical neck. Of this no doubt existed, for the ends could be made to crepitate, and also to bend freely upon each other. I discovered, also, the head of the bone in the axilla, and supposed it was dislocated in that direction. The swelling was considerable, and only temporary dressings were applied. On the 28th, seven days after the accident, I consulted with Dr. White, and we concurred in the above diagnosis. On the 29th I consulted with Dr. Sprague, and we also being agreed in opinion, I proceeded with Jarvis's adjuster to attempt a reduction of the dislocation. The patient was advised that we should probably not succeed. The extension was continued nearly 30 minutes, and no change in the position of the bone was effected. It must be remembered that the fracture of the humerus was at a point so near the joint that it was impossible to seize upon the upper fragment, and we only hoped to succeed in the reduction through the aid of such soft attachments as might continue to exist between the upper and lower fragments, and by pushing on the head of the bone as it lay in the axilla. Renouncing at length all expectation of ever reducing the dislocation, we adjusted the fracture of the humerus, and applied the usual lateral splints and roller, placing a moderate pad in the axilla, and then securing the arm tightly to the body.

The patient was too ill to leave his bed, and was laid on his back, with his left forearm across his chest. The same dressings were continued, with only occasional removals for the purpose of examining the fracture, until the 1st of January, 1850, nearly six weeks, when the bandage and splints were finally laid off. The fracture was then united. I now discovered, also, that the head of the humerus was exactly in place, and so it has remained ever since.

The motions of this shoulder are as extensive and free as before the injury, and much more so than the motions of the right shoulder. There is no depression under the acromion, or fulness in the axilla. In short the shoulder is perfect. Possibly what we supposed a dislocation, was a fracture of the neck of the scapula, allowing the head of the humerus with a portion of the scapula to fall into the axilla; and, if so, we must assume that by means of the axillary pad, and the band securing the arm to the body, the reduction was effected without our knowledge or intention. If this explanation is not adopted, we must believe either that the head of the dislocated bone resumed its place in consequence of our manipulations, and without our knowledge, or through the subsequent pressure of the axillary pad; or that Drs. Sprague, White, and myself, with others, were altogether in error in supposing that the head of the bone was ever in the axilla. Which of these several suppositions is the most probable, I shall not attempt to determine.

CASE 8. *Simple fracture, complicated with fracture of the forearm in its lower third. Result perfect.* (See Fracture of the Forearm, Case 31.)

Matthew Rigany, æt. 23. Admitted to the hospital May 7, 1849. The accident had occurred on the 3d, by having had his arm caught in the crank of a hand-car, when the car was under full motion.

A broad gutta-percha splint was applied to the palmar surface of the forearm and hand, and a broad splint to the dorsal surface of the forearm, and smaller splints were laid around the humerus; the whole being secured by a roller.

On the 6th of June, a starch bandage was substituted, the swelling having sufficiently subsided. On the 16th this was removed, and the patient dismissed, cured. There was no shortening of either the arm or forearm; but the arm was very slightly bent at the seat of the fracture.

Below Surgical Neck (Upper Third).

CASE 9. *Fragilitas ossium. Simple fracture, occurring at several dates. Union without displacement.*

The following account of this interesting case was furnished by Dr. Mixer, of Buffalo, who was the attending surgeon. I was permitted, however, myself to see the patient at different times, and to examine the arm.

"I was first called on the 21st of January, 1851, to see John Thomas, a native of Wales, Eng., æt. 54; a tailor by trade; light complexion and light hair; who had an hour before broken his right humerus at about the union of the upper and middle thirds. It had occurred while raising about 14 lbs. of clothing to a shelf as high as his head, and seemed at the time as though he had received a severe blow on his arm.

"I found the fracture quite transverse, a 'pipe-stem' fracture. There was but little swelling or pain. After a few days I applied the starch bandage or roller, and union took place as promptly as in ordinary fractures, notwithstanding the seeming want of vitality in the bone. As a matter of precaution, I advised him to keep a part of the splint bandaged to the arm for one or two months. Again I was called to see Mr. T. June 11, 1852, and found he had fractured his left arm at about one-third the distance from the elbow, while taking down the shutters to his store. This was also transverse, or nearly so. I again applied the paste splints, and in due time he was well. In this, as in the first fracture, very little inflammation supervened.

"Again, on the 15th of November, 1853, Mr. Thomas called at my office to say that his arm had troubled him for two or three months, and that he was obliged to raise it with the other hand on the cutting table, yet that he found but little difficulty in cutting clothes all day, although it was not as strong as the other arm. On examining it I found the bone broken near the centre of the right arm, and so very flexible that I could bend it at an angle of from ten to twenty degrees. Here I expected great difficulty in effecting a union of the bones, as they had been in that condition two or three months; and I so expressed myself to him. I immediately applied the same dressing as before, and union was effected in nearly the same length of time as before. I then had prepared a permanent paste splint, and recommended him to wear it constantly.

"Soon after that, Mr. T. went into the country to reside, and I did not see him again until November 30, 1854, when he called to have me apply the splint to his left arm, as it had troubled him of late.

"On examination, I did not detect any fracture; still the bone seemed quite sensitive, and he had the same rheumatic pains which had preceded all the other fractures, for two or three weeks. I applied the dressings, and have not seen him since, but have recently learned from his daughter, who resides in the city, that her father died of dysentery in October last." (1855.)

CASE 10. *Simple; slightly oblique fracture. Union perfect.*

B. Franklin McCall, of Buffalo, æt. 11. I dressed the fracture with four lateral splints. At the end of eight weeks it was perfectly united, and without deformity.

CASE 11. *Simple oblique fracture. Union without shortening or deformity.*

James Cronin, of Buffalo, æt. 30, very intemperate. He had his left arm broken September 29, 1853, by a log which rolled upon him. The fracture was simple and oblique, and situated just in or above the insertion of the deltoid. It was dressed by Dr. Nott, of Buffalo, and on the third day Dr. Nott sent him to the hospital.

On the night after his admission, in a fit of delirium tremens, he removed all the dressings, and on the following morning his arm was much swollen. The fragments were displaced, and the muscles were contracting violently. Having reduced the fragments as well as possible, I applied two broad and long splints of binder's board, securing them with rollers covered with flour paste. Notwithstanding the use of opium in full doses, he continued delirious, and on the fifth day of the fracture (October 4th), I found everything loose about the arm. I therefore again removed all the dressings. We now determined to make an attempt to accomplish permanent extension and counter-extension. For this purpose we lifted the elbow upwards and outwards to relax the deltoid, and then having made extension, we fitted carefully a large gutta-percha splint to the forearm and axilla, in such a manner as that when the splint was secured to these several parts the arm could not fall to the side of the body, and in proportion as it did fall downwards it would make extension upon the arm. This splint was well padded and secured with rollers. A pillow was also tied under the arm.

Oct. 5. The dressings remain in place and seem to accomplish everything we could desire.

9th. He is still delirious at intervals. Dressings all loose, and have been for three days, requiring constant readjustment. We removed them and applied three lateral splints with a cushion in the axilla, and bandaged the whole snugly to the body. Forearm in a sling.

19th. (20th day since fracture.) Removed dressings. Fragments not united. Applied paste bandage, &c.

Nov. 6. (38 days.) Removed dressings. Fragments united. No ensheathing callus; no overlapping; no deformity. This result is to me very unexpected and almost inexplicable.

CASE 12. *Simple fracture and union delayed five months. Result nearly perfect.*

Henry Angles, of Tonawanda, æt. 38, broke left humerus obliquely, in upper third, by a fall from a hay rack, striking upon his elbow.

Dr. F. Hoyer, of Tonawanda, dressed the arm on the same day, with two lateral board splints well padded and sufficiently long. Forearm placed in a sling. Dr. H. saw and examined the arm once or twice a week during the time of treatment. The dressings were first removed about the ninth day. The treatment was continued five or six weeks. Finding at this time that there was no union, Dr. H. removed the dressings entirely, and directed him to use his arm freely. After about one week the splints were again applied in the same manner. Soon after, Dr. H. again removed the dressings, and they were not reapplied until about the 7th of October, 1851.

I saw Angles October 4, 1851, about four months after the accident. The fragments had not then united, and were overlapped about half an inch.

Within three weeks probably from this time union was tolerably firm. Nearly five months elapsed from the time of fracture to the date of its complete consolidation. The shortening remained as when I saw it. He gradually regained the perfect use of his limb.

The habits of this man were rather intemperate, and he had intermittent fever only a short time before the accident occurred.

To these causes mainly the delay in union ought to be ascribed. Mr. Angles died about one year since.

CASE 13. *Simple fracture complicated with abscess and tetanus. Resulting in death.*

Samuel J. Mills, of Buffalo, æt. 35; very muscular; was crushed under an enormous mass of iron, breaking his right arm just above the insertion of the deltoid. Dr. Mixer and myself in attendance. We could not at first discover crepitus. The muscles contracted with great force when the arm was moved, and swelling came on rapidly.

We made as much extension as the patient would bear, and then applied three well padded lateral splints and secured them with a roller. The hand and the forearm were also covered with rollers.

The left thigh was at the same time severely lacerated, and soon became very painful, especially along the course of the anterior crural nerve.

On the seventh day I dressed the arm with gutta-percha splints, and paste rollers. On about the twelfth day, an irritative fever supervened with tetanic symptoms, and on the twenty-second day he died. In the meanwhile abscesses had formed around the seat of the fracture and in the thigh; from the latter of which pus was copiously discharged for many days before his death.

The autopsy showed both of the abscesses to be large; and in relation to the femoral abscess, and the condition of the parts adjacent. Dr. Hunt, who conducted the autopsy, says: "Its entire length was about six inches. The internal saphenous vein was nearly obliterated by a deposit of lymph. The sheath of the femoral vessels was not ruptured; but upon laying it open the femoral vein was seen somewhat thickened, the artery round and elastic. Opposite the points of injury, the inner and middle coats of the artery were ruptured, leaving a ragged and lacerated opening. Below this the artery was imperforate. There was no clot, or other appearance of aneurism. The condition of the anterior crural and internal saphenous nerves was not noticed, though they were involved in the injury."

And of the condition of the arm he adds: "The fracture was at the upper part of the insertion of the deltoid muscle. It was an oblique fracture, and a portion of the insertion of the deltoid was attached to the upper fragment; but the greater part, to the lower fragment of the bone. The muscle itself was torn asunder in the direction of its fibres, by the separation of the fragments. The upper portion rested its broken extremity against the skin of the anterior surface of the arm.

"The lower fragment was carried upwards and outwards by its portion of the deltoid; it was sharp and pointed, and the muscle closely embraced it. I then detached the deltoid from its insertions, and reflected it. Its inner surface was smooth, without any mark of abrasion from the sharpened end of the bone. The cavity of the abscess was now exposed. This cavity, filled with pus, separated the deltoid from its relations with the shoulder-joint; leaving the circumflex artery and nerve projected across the cavity of the abscess, unsupported by surrounding tissues. From the neck of the humerus downward, the cavity involved the ends of each fragment of the bone; at the point of fracture, denuding the periosteum. Thence it extended downward nearly to the elbow-joint, burrowing along between the brachialis anticus and the biceps muscles."

Middle Third.

Case 14. *Fragilitas ossium. Simple fracture (occurring at several dates). Result perfect.*

John Thomas, æt. 56. (See Case 9.)

Case 15. *Simple fracture. Union without deformity.*

E. F., æt. 18, broke his left humerus in its middle third. Simple fracture. Dr. Stinberg, of Palentine, N. Y., dressed the arm. Twenty-five years afterwards, when I examined the arm, there was no evidence that a fracture had ever existed.

Case 16. *Simple fracture, occurring during labor. Union without deformity.*

Catharine McKinney, of Buffalo, was born June 3, 1855. The mother was in labor six or eight hours. Labor not severe. She does not know whether the midwife used violence or not.

The child was wrapped up and not examined or washed until the third day, when the mother discovered that the left arm was broken completely, so that it moved as freely as the elbow-joint. Dr. J. T. Lockwood, of Buffalo, was called, and applied lateral splints and bandages. On the seventeenth day after the birth of the child, Dr. Lockwood requested me to see it with him.

The seat of fracture, the lower end of the middle third, was then surrounded with a perfect ferule of ensheathing callus, which, owing to the softness of the flesh, could be very easily felt and defined. The fragments were united and in place. Dr. Lockwood said he found them firm on the 14th day. We reapplied a splint made of gutta percha.

April 1, 1856. I examined the arm. The seat of fracture could not be felt, there being no overlapping or remains of ensheathing callus. The arm is in every respect like the other.

CASE 17. *Fracture resulting from secondary lues. Perfect union.*

A. A., aged 45, had chancres two years since (1849). Has had no bubos or secondary symptoms until now. His gums are now spongy. Six months ago a pain commenced in the right humerus, and one month later, from a slight accident, the arm broke at the seat of pain. In four months it was united and perfect.

About four months since, the left humerus began to pain him in a similar manner, and he is apprehensive that it will break also.

CASE 18. *Simple fracture. Union with shortening.*

J. M. C., æt. 68, broke his right arm near its middle. It was dressed by a surgeon, in Mexico. Two years after the accident I saw him, in Auburn State Prison. The arm was shortened about one inch, and it was not as strong as before.

CASE 19. *Simple fracture. Shortened.*

Charles Clark, of Otisco, Onondaga Co., N. Y., æt. 33, broke his left humerus near the middle. Dr. Luther French, of Otisco, dressed the fracture with splints, &c. The arm, after thirty years, is shortened half an inch, and a moderate displacement can be felt at the seat of the fracture.

CASE 20. *Simple fracture. Union with shortening.*

Sutter, of Buffalo, æt. 13, broke his arm through nearly the middle of the humerus. Dr. John A. Jeyte, of Buffalo, was called and treated the fracture.

Five weeks after the accident, I measured the arm, and found it shortened half an inch.

CASE 21. *Simple fracture. Non-union of the fragments.*

James Campbell, of Canada West, æt. 35, an employé on the

Buffalo and Brantford Railroad. His right arm was broken a little below its middle. Fracture simple. It was dressed by Dr. Jerron, a very intelligent Canadian surgeon, at Brantford, C. W.

Five months after the fracture he called upon me. I found the elbow fixed at right angles, with muscular anchylosis, and no union at the seat of fracture.

He promised to return and place himself under my care, at the hospital, but he did not, and I have not learned the final result.

CASE 22. *Simple oblique fracture. Delayed union. Fracture made to unite after straightening the arm, &c.*

Michael Mahar, laborer, æt. 35, broke his left humerus just below its middle, Dec. 14, 1853. The arm was dressed by a surgeon in Canada West, and who is well known to me as exceedingly "clever." After a few days from the time of the accident, "the starch bandage was put on as tight as it could be borne, and brought down on the forearm so as to confine the motions of the elbow-joint."

Six weeks after the injury, Jan. 29, 1854, Mahar applied to me at the hospital. No union had occurred. The motion between the fragments was very free, so that they passed each other with an audible click. There was little or no swelling or soreness. In short, everything indicated that union was not likely to occur without operative interference. The elbow was completely anchylosed. His health was unimpaired.

I explained to my students what seemed to me to be the cause of the delayed union, and declared to them that I did not intend to attempt to re-establish adhesive action until I had straightened the arm. They had just witnessed the failure of a precisely similar case, in which I had made the attempt without straightening the arm, and without success.

Feb. 6, 1854. I had succeeded in making the arm nearly straight. I now punctured the upper end of the lower fragment with a small steel instrument, and as well as I was able, thrust it between the fragments. Assisted by Dr. Boardman, I then applied a gutta percha splint from the top of the shoulder to the fingers, moulding it carefully to the whole of the back and sides of the limb, and securing it firmly with a paste roller.

March 4. (Not quite four weeks after the application of the splint) I opened the dressings for the second time, and carefully renewed them. A slight motion was yet perceptible between the fragments.

18th. I opened the dressings for the third time, and found the union complete. This was within less than forty days.

The patient was now dismissed. On the 29th of April following, the bone was refractured. Mahar had been assisting to load the "tender" to a locomotive. While the train was just getting in motion, he was hanging to the tender by his sound arm, when another laborer seized upon his broken arm to keep himself upon the car, and with a violent and sudden pull wrenched him from the tender, and reproduced the fracture.

The next morning I applied the dressings as before, and did not remove it during three weeks; at the end of this time the union was again complete. The splint was, however, reapplied, and has been continued to this time—a period of about six weeks.

CASE 23. *Comminuted fracture. Union without shortening.*

Peter McCarty, of Buffalo. (See Fracture of Lower Third, Case 32.)

Above Base of Condyle (Lower Third).

CASE 24. *Fragilitas ossium and simple fracture (occurring at several dates). Union without displacement.*

John Thomas, æt. 56. (See Case 9.)

CASE 25. *Simple fracture. Union perfect.*

Emma Hollidge, of Buffalo, æt. 3, broke her right arm in Feb., 1852, two inches above the elbow. The fracture was dressed by Dr. Sprague, of Buffalo. Three months afterwards, Mr. Hollidge brought her to me to know whether the slight stiffness of the elbow which was remaining, did not indicate that it had been badly set.

I discovered no other imperfection than the stiffness, and this I assured him would soon disappear.

CASE 26. *Simple fracture. Perfect union.*

W. C., æt. 4, broke his humerus through its lower third. It was dressed by a surgeon in Burlington, Vt. Twenty years after, I saw and examined the arm in the Auburn State Prison. The union was so perfect that the point of the fracture could not be discovered.

CASE 27. *Simple fracture. Union nearly perfect.*

H. Copp, æt. 18, had his arm broken, February 10th, 1854, by the fall of a tree upon it. Dressed within an hour, by Dr. H., of Buffalo.

Admitted to the hospital, Feb. 12, and dressed by myself with starch and pasteboard splints, on the 15th.

March 10. Fragments united with very slight overlapping; perhaps one-quarter of an inch. Dressings continued. Dismissed.

CASE 28. *Simple fracture. Result nearly perfect.*

Silas McNeal, of Orleans Co., [illegible] 32, broke his humerus through its lower third. Dr. Beecher, of Gaines, Orleans Co., dressed the arm.

Fifteen years after the accident, I found the elbow a little stiff, so that he could not straighten it perfectly. In other respects the arm was as before the fracture.

CASE 29. *Simple oblique fracture. Result nearly perfect.*

James Gallon, æt. 40, of Albion, N. Y., fell from a wagon and struck upon his elbow, breaking the humerus obliquely, two and a half inches above the condyles.

Dr. D. M. Hotaling, a very intelligent surgeon of Waterport, Orleans County, was called. Dr. H. applied three splints, carefully padded, which were renewed on the ninth day. The same splints were reapplied and continued in all forty days.

At this time the elbow was stiff. The humerus united, but it was shortened half an inch, and slightly bent forwards at the seat of the fracture. His purpose in calling upon me was to know whether the elbow was not "spoiled," and whether he ought not to claim damages from the Dr.

I could see no error in the treatment, and nothing unusual in the result, and so I informed him. The arm remained powerless about three months, and then gradually regained its wonted strength under the use of the cold douche. Four years after, he was working as a tanner and currier, flexion and extension were nearly restored, and his arm was about as strong as before.

CASE 30. *Simple fracture. Shortened; arm considerably weakened and wasted.*

A. G. Ellwood, æt. 7, of Clinton, Oneida Co., N. Y. While wrestling, he fell with the weight of his body upon his left arm, breaking it at the upper end of the lower third. Dr. Gridley, of Clinton, dressed the fracture, about three hours after, with splints and rollers.

Fifteen years after the accident, the arm is shortened half an inch, slightly bent inwards at the seat of fracture. The arm is not as strong as the other, and it is considerably smaller.

CASE 31. *Simple fracture. Union with shortening.*

James Evans, sailor, æt. 30, had his arm broken, Nov. 14, 1855, by the crank of a windlass, striking with great force against the front of his arm. The fracture was oblique, at the upper end of the lower third of the humerus.

I found the humerus shortened one and a half inches.

I reduced the fracture and applied a roller from the hand to the shoulder, and to the arm I applied three lateral splints made of binder's board. These I secured with several turns of a roller. The arm was then placed in a sling, a compress laid in the axilla, and the whole arm gently bound to the body.

Dec. 5. The bandages are tightened by a needle and thread.

14*th*. Dr. Samo, marine surgeon, removed the splints, but continued the roller. The fragments were united, but overlapped one and a quarter inches. The superior fragment is in front of the inferior.

CASE 32. *Comminuted fracture. Union without displacement.*

Peter McCarty, of Buffalo, aged about 30, fell, Oct. 8, 1855, into a ditch in the night, breaking his right arm at two points, one fracture being three inches above the elbow-joint, and one nine inches above. (See Fracture of Middle Third, Case 28.)

I saw and dressed the fractures thirty-eight hours after the accident. Limb not much swollen. I applied a carefully padded, broad, and nicely moulded gutta-percha splint, which extended from the top of the shoulder to below the elbow, the forearm being placed in a sling at right angles with the arm.

The fragments united in the usual time, and without shortening or deformity.

CASE 33. *Compound fracture. Non-union.*

John Reynolds, of Hornelsville, æt. 30, broke his left arm, Aug. 2, 1853, in jumping from the cars when they were moving at full speed. The fracture was at the upper end of the lower third, oblique and compound. There were two wounds near the lower end of the humerus, through both of which a fragment protruded. Dr. Ward, of Hornelsville, first dressed the fracture with an angular splint.

On the 5th of August, Dr. Van Curen, of Bath, took charge of the patient. Dr. V. found the arm very much swollen, and vesicated at several points.

Dr. Van Curen applied also an angular splint, placing the forearm at right angles with the arm.

This mode of dressing was continued six weeks, the wounds discharging all the time and being regularly dressed. No union having now taken place, Dr. Van Curen removed the angular splint, and applied three lateral splints to the arm. These were continued five or six weeks longer. The ends of the fragments were then rubbed violently together, and angular splints, made of binder's board, again snugly applied.

Dec. 27. Reynolds came to the hospital, and, on the 31st, five months after the accident, I examined the arm, and found the fragments moving very freely upon each other and slightly overlapped. I made an incision to the bone at the outer margin of the biceps muscle, and, having thrust a small trocar, covered with its canula, between the ends of the fragments, I withdrew the trocar and left the canula in the wound; this I secured with a bandage. The house surgeon then applied a right-angled gutta-percha splint, carefully moulded and padded.

On the fifth day, the inflammation, swelling, and suppuration were such that I was obliged to remove the canula. On the fourteenth day, inflammation not having abated, we applied emollient poultices; and, on the fifteenth day, I opened an abscess in the arm.

Jan. 18. The poultices were discontinued, and the patient was put upon generous diet and mineral tonics.

22*d.* I again punctured with a trocar the ends of the bones, and then applied splints, secured with bandages saturated with flour and the whites of eggs.

On the 31st, the wounds were still discharging copiously.

Feb. 12. Reynolds left the hospital. The bones were still ununited.

CASE 34. *Compound, comminuted fracture, complicated with dislocation at the shoulder-joint. Union with deformity. Shortening and anchylosis. Dislocation unreduced.*

John Phaley, æt. 25, broke his right arm, Sept. 15, 1852, at the upper end of the lower third, and also the left leg, in a railroad accident. The fracture in the arm was comminuted. The right shoulder was also dislocated at the same time. He was seen first by Dr. Rogers, of Dunkirk; subsequently, on the second or third day, by Dr. Pratt, of Buffalo. Twelve days after the fracture, I found him an inmate of the hospital. The arm was then much swollen, and powerless; the upper end of the lower fragment projecting in front, and a sinus leading to the broken surfaces. At the end of six weeks, he left the hospital. The fragments were then united, but the lower fragment lay in front of the upper. There was also a sinus at the seat of fracture, communicating with the fragment of dead bone. Forearm powerless and much swollen, and elbow anchylosed. Some months later, I removed a considerable fragment of bone, and the sinus closed. On the 8th of March, 1853, about six months from the date of the accident, I discovered that the head of the right humerus was dislocated—a circumstance to which my attention had never been called before, and which neither Dr. Rogers nor Dr. Pratt had noticed. Two years after the accident, the head of the humerus could be felt and seen distinctly under the clavicle, having formed for itself a new socket. The deltoid was atrophied, and a marked depression existed under the acromion. Very little motion existed in the elbow-joint, which was bent at an obtuse angle. Motion in the new shoulder-joint was tolerably free, but accompanied with a grating sensation. His elbow hung outwards from his body, but not backwards. The arm was shortened one inch. He could use his arm and hand to cut his food, but he carried his food to his mouth with his left hand.

Base of the Condyles.

CASE 35. *Simple oblique fracture. Union without deformity or shortening.*

Wm. Kane, of Buffalo, æt. 6, by a fall July 28, 1853, broke his right humerus obliquely, just above the condyles. Direction of fracture downwards and forwards.

I saw the child soon after the fracture. The fragments were easily reduced, but immediately became displaced when left to themselves. I dressed it carefully with a paste bandage supported by an angular splint. (Rose's splint.)

Dr. Boardman, one of the surgeons of the Buffalo Hospital, subsequently took charge of him, and on the following day, finding that the dressing was inefficient, we applied paste bandages and felt splints.

A good deal of inflammation and swelling followed the injury.

Aug. 8. (Eleventh day.) Dr. B. permitted me to see it. The fragments seemed to be united. Arm still remained a good deal swollen.

Three months after this I examined the arm before the medical students of the college. The union was firm, and the seat of the fracture could not be felt. Motions of the elbow-joint nearly perfect.

March 20, 1856. He cannot bring this forearm to quite so acute an angle as the other, and when he straightens the forearm it falls a little further back. In all other respects it is perfect. The seat of fracture cannot be felt, and there is no shortening.

CASE 36. *Simple fracture. Result imperfect.*

Nicholas Lang, of Millgrove, N. Y., æt. 4, fell down stairs September 9, 1855, and broke the right humerus just above the condyles. Direction of fracture, obliquely downwards and forwards. The fracture was dressed by Dr. Ernst Pupikofer, of Erie Co., N. Y., and on the eleventh day he was brought to me. The bones were not then united.

Union occurred in about four weeks, and the splints were entirely removed in about five weeks.

Three months after the accident, the power of extension was nearly complete, but flexion was restricted to an angle of about 60°. Rotation of forearm perfect. The utility of the limb is in no way impaired.

CASE 37. *Simple fracture.*

Louis Kock, of Buffalo, æt. 6, fell September 1, 1853, and broke the right humerus just above the condyles. Simple fracture. Dr. Mixer, of Buffalo, in attendance.

I saw the patient with Dr. Mixer on the second day. The lower fragment was displaced backwards. I have only been able to learn that the fracture united in the usual time.

CASE 38. *Simple fracture; shortened, deformed and maimed.*

Frederick Niento, of Buffalo, æt. 60, fell on his right elbow March 5, 1851, and broke the humerus just above the condyle. Dr. Hauenstein, of Buffalo, dressed the fracture. Seven months afterwards he called upon me. It was then shortened half an inch, and considerably deformed at the seat of fracture. The upper fragment is behind the lower. There remains only a limited motion at the elbow-joint.

CASE 39. *Simple fracture. Union with deformity.*

July 28, 1849. An Irish boy, about nine years old, was sent to me by Dr. Samo, with a fracture just above the condyles which had occurred two months before, in Ireland. It was dressed by an Irish surgeon, and attended by him about two weeks.

The lower fragment was displaced backwards and united firmly. Motions of the joint were tolerably free.

CASE 40. *Simple oblique fracture. Union with deformity. Paralysis and contraction of finger. Prosecution.*

Charles Farnham (son of Orlando Farnham, a very respectable citizen of Chautauque Co., N. Y.) æt. 8, fell from a height of four feet, striking upon the floor, and breaking his left humerus just above the condyles. The direction of the fracture was obliquely downwards and forwards. Dr. A. H., of Pomfret, was called, but refused to visit the patient, declaring that he did not practice surgery. Two other physicians were then successively called, but they also declined positively, and Dr. H. being again earnestly pressed to go, consented, though very reluctantly.

Dr. H. determined easily the nature of the fracture, but as the arm was already much swollen, he concluded not to apply immediately any splints.

On the third day he reduced the fragments as well as he could, and applied two right-angled splints, one on the palmar and one on the dorsal surface of the arm and forearm; with suitable compresses, rollers, &c. Also two small lateral splints.

These dressings he continued to the arm during a period of four or five weeks, when they were finally removed.

June 19, 1850, about nine months after the accident, the lad was brought to me for examination.

I found the fragments overlapped one inch. The upper fragment projecting in front, and the skin covering its sharp point being very thin and tender. The motions at the elbow-joint perfect. The hand was flexed forcibly upon the wrist; the first phalanx of all the fingers extended, and the second and third forcibly flexed; supination and pronation completely lost. The arm weak and painful. The ulnar nerve could be felt lying across the projecting end of the bone.

In the hope that some favorable change might result to the hand by relieving the pressure upon the ulnar nerve, yet with not much expectation of success, I exposed the bone and removed the projecting fragments with a chisel and saw. The ulnar nerve had to be lifted and laid aside. The wound healed kindly, but the hand, one year from this date, remained in the same condition as before the operation.

The surgeon was subsequently prosecuted, but the case never came to trial.

CASE 41. *Simple fracture. Union with maiming and deformity of the forearm.*

B. G. McKay, of Skaneateles, æt. 4; left arm; Dr. Samuel Porter, of Skaneateles, well known throughout all that region as an eminent surgeon, took charge of the fracture.

I examined the arm twenty-three years after, and found a deformity at the point of fracture and at the elbow-joint, such as prevented complete supination of the forearm.

The forearm was also deflected outwards from the line of the arm several degrees. The arm had always been weak. The ulnar nerve is morbidly sensitive to this day, and the ulnar side of the forearm, with the ring and little finger, have always remained numb since the accident.

CASE 42. *Compound comminuted fracture. Union with deformity, &c.*

Mary Cotesworth, of Buffalo, æt. 2, fell down stairs, and broke her left arm just above the condyles, in May, 1853. The bone protruded in front an inch or more. Dr. Hackstein dressed the arm with light dressings. Violent inflammation ensued, and several small fragments of bone came out: the last fragment about six months after the accident.

Two weeks after the accident, May 30, 1853, I saw the patient with Dr. Hackstein. The wound was discharging copiously. Elbow and arm much swollen. We dressed it carefully with a splint well padded, and laid along the under side of the arm and forearm. The wound ceased discharging soon after the last fragment came out.

April 2, 1856, three years after the the arm was broken, I found the bone so smoothly united that I could not trace the line of fracture.

The humerus was shortened half an inch. The elbow was partially anchylosed, the forearm being extended at about an angle of 15° with the arm, and capable of being flexed through about 10° more; it was also forcibly proned. The elbow was occasionally painful, and the arm always weak.

CASE 43. *Compound comminuted fracture. Partial anchylosis, overlapping, &c.*

James Ashman, aged about 35, of Paris Hill, Oneida Co., N. Y. Drs. Knight and Bly dressed the fracture. A small fragment came out.

Three years after the accident, he was an inmate of the Buffalo Hospital. The humerus was shortened three-quarters of an inch, and the elbow could be flexed and extended only through two or three degrees of a circle.

CASE 44. *Oblique, comminuted, compound fracture. Union without deformity or shortening.*

Mr. ——, of Geneva, æt. 7. The bone was broken obliquely downwards and forwards. The lower end of the upper fragment was pushed through the skin an inch. Drs. Pierce and Ashly, of Lyons, N. Y., reduced and treated the fracture with a right-angled splint; declaring to the parents that anchylosis was to be anticipated. About one year after this a small fragment of bone escaped. After seventeen years, there remains no indication of where the fracture occurred, and the motions of the joint are perfect.

Internal Condyle.

CASE 45. *Simple fracture of apophysis. Result perfect.*

George Bull, of Buffalo, æt. 6, fell, July 27, 1849, and separated the apophysis from the internal condyle of the right humerus. Fracture did not extend into the joint. The fragment was displaced slightly.

I was immediately called, but applied no dressing. Aug. 3, I applied a paste bandage.

Dr. Silas Hubbard subsequently took charge of the patient.

April 7, 1856. I find the arm in every respect perfect, except that the apophysis is carried backwards about two lines, and upwards towards the shoulder about three lines; and it is a little more prominent than the apophysis on the opposite arm; the right elbow-joint measuring three inches and three quarters in its transverse diameter, and the left three and a half. He says the arm was well in eight weeks.

CASE 46. *Simple fracture. Result perfect.*

Bernard Smith, æt. 12, broke the internal condyle of the humerus. It was dressed by a surgeon. For six months or more, it was nearly anchylosed. The anchylosis gradually yielded, and thirty-eight years after the accident, when I examined the arm, the motions of the joint were perfect. It has, however, been occasionally painful to the present time.

CASE 47. *Simple fracture, probably not extending into joint. Result perfect.*

Charles Clark, of Buffalo, æt. 11, fell, October 9, 1848, and struck on the internal condyle of the left humerus. He came immediately to my office. The internal condyle was loose, and motion produced a distinct crepitus.

I do not think the fracture extended into the joint. He could flex and extend the arm perfectly, and rotate the forearm.

I applied a right angled splint, which I removed at the end of five weeks.

Three months after he could nearly straighten the arm, and all its motions were nearly perfect.

CASE 48. *Simple fracture. Anchylosis, etc.*

George Strong, of Ellory Centre, N. Y., æt. 6, fell and struck on his elbow.

The patient was seen by three excellent physicians in succession; but they did not agree as to the nature of the accident. The first two regarded it as a fracture, and applied splints. The third regarded it as a dislocation, and having removed the splints, and, as he supposed, reduced the dislocation, he put the arm in a sling.

Three months after the injury was received he called upon me. The inner condyle was very prominent, and surrounded at its base with callus. The arm was nearly anchylosed in a rectangular position. Pronation and supination perfect.

CASE 49. *Simple fracture, with displacement; temporary anchylosis, &c.*

Ed. E. Kendall, of Phillipston, Mass., æt. 9, broke the inner condyle of the right arm. Dr. Stone, of Phillipston, was in attendance. Sixteen years after the accident, while Mr. K. was a student of medicine, I examined the arm. The internal condyle was displaced forwards. For about one year after the injury the elbow was quite stiff. Its motions are now perfect.

CASE 50. *Simple fracture.*

Michael Kelly, of Buffalo, æt. 14, fell with his right arm under him. Dr. Ring was called. By request of Dr. Ring, I saw the arm on the same day. The inner condyle was movable, and occasionally we could detect crepitus. We dressed the arm with a right angled splint. I have not been able to ascertain the result.

CASE 51. *Simple fracture of apophysis of condyle. Resulting in deformity.*

Francis Clifford, of St. Catharines, C. W., æt. 15, fell, in wrestling, with his right arm under him, Dec. 22, 1855.

The arm was seen by Dr. Henry Goodman, of St. Catharines, C. W., and treated by him. March 18, 1856, three months after the accident, the lad was brought to me by his father, and they made the following statement:—

"Dr. Goodman said the bones were dislocated inwards, and by pulling and manipulation he reduced them. The elbow was then greatly swollen. He applied no splints, but only treated the arm in such a way as to subdue the inflammation.

"Subsequently it was seen by another surgeon, in Canada, who believed that the ulna was at the time of the accident displaced inwards, and that it still remained unreduced. Dr. Theophilus Mack, a distinguished surgeon of St. Catharines, had also seen the arm, and did not think the ulna was now out of place, but that the inner condyle was broken off."

I find a fragment—the apophysis of the internal condyle—broken off, and removed downwards towards the wrist one inch and a quarter, where it is immovably fixed.

The elbow is partially anchylosed, so that it cannot be straightened completely nor flexed to a right angle. Pronation and supination are perfect. Dr. Mack had endeavored to overcome the anchylosis by moderate force applied gradually by means of a splint, but he had thus far been unsuccessful.

The father had already commenced an action against Dr. Goodman for damages.

It is quite certain that the articular surfaces are not now displaced. Whether they were displaced originally it is, of course, impossible for me to say. Whether they were or were not, I do not understand how the surgeon is to blame for not recognizing this fracture when the limb was so much swollen, nor do I believe that he could have prevented the displacement of the fragment if he had discovered the fracture. It is very probable, also, that the lad will ultimately have a fair use of his elbow-joint; and all this I felt it my duty to state to the parties, to which the father replied only that he could not afford to have his son lose the use of his arm!

Case 52. *Simple fracture; resulting in anchylosis, &c.*

Noyes Atwood, of Lancaster, æt. 11, fell from a horse, striking on his left elbow. Dr. Potter, of Lancaster, dressed the fracture. Five weeks after the accident he consulted me. The inner condyle is displaced upwards three-quarters of an inch. The olecranon process has followed this fragment. Large amount of callus in front at seat of fracture. The elbow is nearly anchylosed at an obtuse angle.

March 10, 1856. More than a year after the accident, the elbow remains partially anchylosed. He cannot carry his hand to his mouth except by bending his head forwards.

Case 53. *Simple fracture, with displacement, slight maiming, &c.*

Franklin, Barrows, of Attica, æt. 9, fell and broke left internal condyle. It was dressed by a regular surgeon. Six years after the accident, while Mr. B. was a student of medicine, I examined the arm. The internal condyle is displaced downwards towards the wrist half an inch. Cannot straighten the arm completely. Can only flex it slightly, the elbow being nearly fixed at an obtuse angle. The power of pronation and supination imperfect. He thinks the arm is as strong as before.

Case 54. *Fracture extending into joint; complicated with displacement of ulna. Result imperfect.*

Philip Yout, of Buffalo, æt. 8, fell, July 8, 1849, striking upon the right side and arm. A Catholic priest first attempted to reduce it; but on the morning following the child was brought to me.

The elbow was then considerably swollen, and the diagnosis was rendered somewhat difficult. It became quite certain, however, when Mr. Otis and myself had completed our examination, that it was a fracture of the internal condyle extending into the joint. The ulna fell easily into the space between the fragments, and could only be retained in its natural position by force.

I dressed the arm with an angular splint, constructed with a movable joint, and directed cold water to be applied to the dressings.

On the 11th I removed the splint, finding it painful, and left the arm on a pillow with only cold water dressings.

15th. I applied the starch bandage. The patient eventually recovered with a stiff elbow.

I subsequently learned that this same elbow had been broken before, and that the joint had been partially anchylosed for some years.

CASE 55. *Fracture complicated with a dislocation, slight maiming, and deformity.*

David Hersee, of Williamsville, N. Y., æt. 18, fell from a tree. Dr. Ham, of Williamsville, in attendance. Dr. H. found a dislocation of the radius and ulna of the right arm, with also a fracture of the inner condyle extending into the joint.

Five years after, I found the radius and ulna in place, but the inner condyle displaced downwards and forwards half an inch. The condyle is very broad and flat. When the arm is extended, the forearm is deflected to the radial side.

This arm tires sooner than the other. In all other respects its functions and condition are natural; but for about a year the elbow was quite stiff.

External Condyle.

CASE 56. *Simple fracture. Union with deformity.*

Patrick Whalin, of Buffalo, æt. 4, fell on the door-steps in September, 1854, breaking the external condyle of the left humerus. The fracture extended into the joint near its middle. He was taken to the hospital; Drs. Winne and Smith in charge. For several days measures were taken to subdue inflammation, but no splints applied. September 28, Dr. Smith applied two right-angled pasteboard splints, well padded with cotton.

One year after the fracture I find the external condyle very prominent, being thrust to the radial side of the arm, and neither forwards nor backwards. The whole forearm is strongly deflected to the ulnar side. All the motions of the elbow-joint are nearly perfect, as well as pronation and supination of the forearm. The olecranon seems to have been carried a very little, perhaps three lines, inwards upon the inner condyle; while the head of the radius is carried to the radial side with the external condyle. The remarkable inclination of the forearm to the ulnar side only exists when the forearm is extended upon the arm. When it is flexed no such distortion is present.

CASE 57. *Simple fracture. Union with deformity.*

Rollin Banta, of Buffalo, æt. 5, fell, July, 1852, and struck upon the left elbow, breaking off the outer condyle of the humerus; the fracture extending obliquely into the middle of the joint. Dr. Mixer was called and dressed the arm. On the 30th of July, some three or four days after the accident, Dr. Mixer requested me to see the case with him. The nature of the injury was apparent, and we informed the parents of the probability of anchylosis.

Adjusting the fragments as well as we could, we applied a gutta-percha splint to the arm and forearm, having fitted it accurately and padded it sufficiently.

I saw the lad again September 3, and we removed the dressings.

April 1, 1856. Nearly four years after, I find the elbow admitting pretty free motion, so that he can straighten the forearm to within about ten degrees, and can flex it nearly as perfectly as the other. Pronation and supination are perfect. There is, however, a considerable projection of the external condyle; this elbow being half an inch wider than the other, but its circumference is the same. The whole forearm is deflected slightly to the radial side. He often complains of a pain in the middle of the back of the joint, in the seat of the fracture. The outer condyle is neither carried forwards nor backwards, but is only spread outwards, or to the radial side, carrying the head of the radius with it.

When this arm first came out of the dressings we could see scarcely any deformity, but as the swelling gradually subsided it became more apparent, and it even led us to suspect, at one time, that the condyle was expanding under an inflammatory action.

CASE 58. *Simple fracture. Union with deformity.*

Rachel Wright, of Buffalo, æt. 88, fell in March, 1852, striking upon her elbow. She was carried to the watch-house, and the arm was dressed by Dr. Gray. Subsequently she was removed to the almshouse, and Drs. Winne and Forbush were in attendance.

Two months after the accident, I found the outer condyle removed half an inch from its natural position, producing at the elbow-joint a striking deformity. She was unable to straighten the arm perfectly.

CASE 59. *Simple fracture. Union with deformity.*

John R. Dobbins, of Erie, æt. 7, fell on left arm, in March, 1851, breaking the outer condyle of humerus. Dr. C. Brandis, of Erie, and Dr. Wood, of the navy, were in attendance.

Eleven weeks after the accident he was brought to me. The forearm was then nearly at a right angle with the arm, and the elbow admitted of only very slight motion. Pronation and supination were perfect.

Dec. 20, 1855, nearly four years after the accident, I find the forearm not quite straightened out, but nearly so, and the motions of the elbow-joint very extensive. When he attempts to straighten the arm the forearm is deflected outwards. The head of the radius, also, seems to press forwards as if the condyle upon which it rests was carried in this direction. His arm is as strong and as useful as the other.

CASE 60. *Simple fracture. Union with deformity, &c.*

June 22, 1847, a son of Daniel Hodge, of Buffalo, æt. 8, fell several feet, striking on the left side and arm. Dr. George Burwell being called, requested my attendance, also, in consultation.

We found a distinct crepitus in the elbow-joint, and the motions of the fragments were plainly felt. Flexion and extension at the elbow-joint were unimpaired. Rotation of radius not painful. Flexion slightly painful. When the external condyle was seized between the thumb and finger, and moved forwards or backwards the radius also moved with it. The external condyle projected laterally and a little backwards, so that the elbow measured one-quarter of an inch more in diameter than the opposite.

We dressed the arm with Rose's right-angled splint, placing the splint at an angle greater than a right angle, and laying it upon the palmar surface. We used, also, pads with rollers, &c.

August 18, two months after the accident, the fragment was united, but the elbow was quite stiff, allowing very little motion. The external condyle remains as at first.

CASE 61. *Simple fracture. Union with deformity.*

E. R., æt. 5, fractured the outer condyle of the humerus. It was dressed, he says, by a surgeon. I examined the arm in the Auburn State Prison, in the presence of the prison surgeon, after the lapse of twenty years.

The broken condyle projects unnaturally, and the humerus at this joint is half an inch wider than the humerus of the other arm. He cannot straighten the arm perfectly. Occasionally the joint is painful.

CASE 62. *Comminuted fracture. Non-union of fragments, but no maiming.*

Henry Gilbert, of Evans, Erie Co., N. Y., æt. 5, was thrown from a horse, August 8, 1855, breaking the external condyle of the humerus. Dr. ——, of Evans, dressed the arm temporarily and sent the lad to me. Dr. Boardman and myself examined and reduced the fracture, as well as we were able to do, about sixteen hours after the accident. We administered chloroform freely, to enable us to make a more satisfactory examination. There were two fragments, and each quite movable. The principal fragment was thrown forwards whenever the arm was flexed to a right angle. We concluded, therefore, to drop the arm and forearm in a position nearly straight, or only slightly flexed. We employed carefully moulded and well padded gutta-percha splints, made fast with the paste bandages.

April 10th, 1856, eight months after the accident, the motions of the arm are free and its strength unimpaired, but a fragment of the outer condyle is not united, except by ligament. It moves freely backwards and forwards when the arm is extended or flexed.

CASE 63. *Simple fracture. Complicated with dislocation of the head of the radius backwards.*

Frederick Keaffer, of Buffalo, æt. 11, fell from a load of hay. Drs. Blanchard and Tilden, both botanic and eclectic physicians, were first called. Dr. Rochester subsequently examined it.

Six hours after the accident he was brought to me. Left arm very much swollen. The external condyle could not be distinctly felt, but on pressing with my finger over its usual seat, there was a crepitus. The head of the radius was plainly dislocated backwards, and separated entirely from the condyle; its smooth button-like head being very prominent. There was great lateral mobility of the elbow-joint. The forearm was prone and fixed in a position slightly flexed. Every attempt to flex or extend it beyond this was very painful.

The fall was received upon the back of the elbow. It is difficult to conceive how a blow from behind should leave the head of the radius dislocated backwards, or how the radius could have separated from the broken condyles, but I think there is no doubt of the fact. Such was the conclusion to which Prof. Rochester had previously arrived, after a very thorough examination, and after an attempt to reduce and retain the fragments in place, made while the lad was under the influence of chloroform. I administered ether, and after a full examination, attempted a reduction of the displaced radius. This was easily accomplished, but the bone was instantly displaced when the pressure was removed. The inflammation was such as not to warrant the immediate application of splints.

Dr. Blanchard subsequently took charge of him.

May 17, 1856, about one year after the accident, I examined the arm. The head of the radius remains dislocated backwards. The external condyle cannot be distinctly felt, but so far as it can be traced nothing abnormal can be discovered. The motions of flexion and extension, of pronation and supination are as complete as before the injury was received, except that the forearm cannot be quite as perfectly extended. The arm is not quite as strong as the other.

Between the Condyles.

CASE 64. *Simple fracture. Union with shortening and maiming.*

J. R. Snow, of East Vienna, Wayne Co., N. Y., æt. 3, broke the left humerus by a fall from a rocking-chair. Dr. Bush, of East Vienna, dressed the arm within an hour.

Eighteen years after the accident, when he was a student of medicine at Buffalo, I examined the arm. The humerus was shortened three-quarters of an inch, and the condyles separated half an inch. The internal condyle was particularly prominent. He cannot straighten the arm completely. Motion produces a grating sensation in the elbow-joint, and occasionally the elbow-joint becomes tender and painful. The muscles on the arm are wasted, but those of the forearm are not.

CASE 65. *Simple fracture. Union with deformity.*

Patrick O'Brien, of Buffalo, æt. 10, was kicked on his left arm by a horse. Dr. M., of Montezuma, N. Y., examined the arm, and said it was out of joint. After a full bleeding, he attempted reduction, and then applied woollen rollers. Twelve days after, he came under my care. The elbow was much swollen and slightly bent. On pressing the condyles together, a crepitus was distinctly felt. The ulna seemed slightly displaced inwards and backwards. Dr. Sprague concurred with me in the opinion that it was a fracture through the condyles into the joint.

I applied an angular splint, with compresses, bandages, &c.

On the 25th day (Aug. 14, 1848), the fragments were not in place, nor could they be made to keep their places.

April 4, 1856. Seven years after the fracture occurred, he can extend the left forearm completely, but cannot flex it quite as much as he can the right. Pronation and supination perfect. The ulna is displaced inwards so much as to conceal entirely the prominence of the internal condyle. The head of the radius is in its socket, but the external condyle is pushed outwards, and with it the radius. The elbow is half an inch wider than the opposite. When he extends the arm, the forearm is deflected inwards (to the ulnar side) at an angle of about 20° or 25°, but when the arm is flexed, the forearm resumes its natural position. The humerus is shortened half an inch. It is occasionally painful across the back of the joint. The arm is not quite as strong as the other, nor as large. He is a ship-builder, and works at his trade.

CASE 66. *Comminuted fracture. One fracture being just above the condyles, and another extending into the joint in such a manner as to separate the inner condyle. Resulting in deformity and maiming.*

Mrs. A. B. Halifax, of Buffalo, æt. 44, fell upon the sidewalk, Jan. 22, 1850, and broke her right arm at the elbow-joint. I was immediately called, and, although the elbow was considerably swollen, the nature of the fracture was pretty evident. The fragments were easily reduced; indeed, the condyle was never displaced. I applied an angular splint, with gutta-percha side splints, &c. &c. No efforts were spared with the limb to make it perfect.

Seven months after the accident, the elbow was nearly anchylosed at a right angle.

April 3, 1856. Six years after the fracture, I examined the arm again. She could now nearly straighten the arm, and flex it almost as much as the other. She could also nearly shut the fingers, but not quite. No deformity at the seat of fracture, nor shortening of the humerus. There was, however, much tenderness over the point of fracture in the shaft of the humerus, and just above the internal condyle, and also where the head of the radius articulates. There was, moreover, a grating sensation occasionally in that joint. She experienced frequent pains in the arm, and especially along the back and radial border of the ring finger. Her hand was weak. During a year or two after the accident, her arm perished very much; but it was now nearly, but not quite, as large as the other. I think, however, the inner condyle is about one-quarter of an inch lower (towards the wrist) than the corresponding process upon the opposite arm. Pronation and supination are perfect.

CASE 67. *Compound comminuted fracture. Union with anchylosis, &c.*

Horace Utley, of Buffalo, æt. 35. Mr. U. was struck by the tongue of a carriage with which a couple of horses were running. The blow was received directly upon the back of the left elbow.

Dr. Sprague and myself were in attendance. We removed some small fragments of bone, and then laid the arm and forearm upon a well-padded splint, to which they were only loosely secured by bandages, &c. We sought only to keep the limb quiet, and to combat inflammation. It was several months before the discharge of matter from the wound ceased.

Seven years after the accident, the forearm was considerably flexed upon the arm, and almost completely anchylosed.

April 3, 1856. Twelve years after the injury was received, the motions of flexion and extension are so far restored that he can extend the forearm to an angle of about 45°, and flex it to a right angle; at this point it seems to strike a solid body like bone. Rotation of the forearm is completely lost, the hand being in a state midway between pronation and supination. Humerus shortened one inch and a half. He has no pain in the arm or hand, nor is the arm weak. He says that during the first year there was no motion in the elbow-joint. No means have been employed to restore its functions, except passive motion, and subsequently constant use of the limb.

Cabinet Specimens.

Upper Third.—Anatomical Neck and Head of Humerus.

Specimen 1. Boiled specimen. Adult. United by bone. Irregular deposits of bone. Head of the bone flattened close to the tuberosities. History unknown. (Henry H. Smith, Philadelphia.)

Specimen 2. Boiled. Adult. Irregular callus. Shaft completely rotated by action of the scapular muscles, so as to turn the back of the humerus forwards. Tendon of biceps also displaced. There is also a fracture of the shaft near its middle. History unknown. (Henry H. Smith, Philadelphia.)

Specimen 3. Dried. Adult. Partly through neck, and partly through the tuberosities. The greater tuberosity being attached to the shaft, and the lesser to the head. United by bone, and with very little ensheathing callus. There is a slight impaction of the fragments. History not known. (Henry H. Smith, Philadelphia.)

Specimen 4. Adult. Partly through anatomical neck. The fracture was produced by a severe injury. Suppuration ensued, and about one year after, Dr. Brainard removed the fragment. It was loose, necrosed, and partially absorbed or macerated. He has recovered a pretty useful arm. (Daniel Brainard, Chicago, Ill.)

Specimen 5. Adult. Partly through anatomical neck. Injury produced by a railroad car. Suppuration. About three months after the accident, Dr. Brainard extracted the principal part of the head of the bone. Patient recovered with a very useful arm. (Daniel Brainard, Chicago.)

Specimen 6. Macerated. Adult. Broken at the junction of the head with the shaft, and then irregularly transverse through the tuberosities, to a point half an inch below the greater tuberosity. No union. History unknown. (Charles A. Pope, St. Louis, Mo.)

Specimen 7. Similar to No. 6, but fracture terminating three quarters of an inch below the greater tuberosity. No union. History unknown.

Dr. Pope remarks of the above cases (6 and 7): "These are not cases of detachment of the epiphyses, as the bones are evidently those of adults; and there is at their lower extremities, above the condyles, no trace of an epiphysary line." (Charles A. Pope, St. Louis, Mo.)

Specimen 8. Macerated. Adult. Broken along the line of union of the head with the body, and also through the surgical neck. The upper fracture is oblique and the lower transverse, and both are united by bone. The upper fragment, or head, has suffered an extraordinary displacement or revolution, so that its articular surface is turned downwards against the head of the bone, and has in this position become firmly united to the shaft; while the broken surface of the head is turned upwards, and is articulated with the glenoid cavity of the scapula. There is also a peculiar curve of the upper fourth of the shaft of the bone; the head, however, remains in the general axis of the body. History unknown. (Charles A. Pope, St. Louis.)

Specimen 8. Dried. Adult. Fragment slightly displaced, but united by bone. (Charles Gibson, Richmond, Va.)

Specimen 9. Dried. Adult. Fracture nearly transverse. The head has united by bone, but at right angles with the shaft. (Chas. Gibson, Richmond, Va.)

							RESULT.				
No.	Age when it occurred.	Time since it occurred.	Sex.	Right or left side.	Character of the fracture.	TREATMENT.	United or not.	When united.	Amount of shortening.	Remarks.	Perfect or imperfect.
						UPPER THIRD (SEPARATION OF EPIPHYSIS).					
1	13 m.	5 m.	M.	L.	Simple	Sling, &c.	N. U.			Cannot raise his arm.	Imp.
						SURGICAL NECK.					
2	65 y.	1 y.	M.	R.	Simple	No dressings after the first week.	U.				P.
3	62 y.	2 m.	M.	R.	Simple	One long gutta percha splint.	U.				P.
4	12 y.	4 m.	M.	L.	Simple	One long gutta percha splint, &c.	U.	21 d.	1 in.	Motions of shoulder joint unimpaired, but lower fragments projecting forwards, &c.	Imp.
5	43 y.	2 y.	M.	R.	Simple		N. U.		1 in.		Imp.
6	15 y.	10 m.	M.	L.	Simple	Lateral splints, &c.	U.	10 d.	1½ in.	Motions of shoulder joint unimpaired, but fragments projecting forwards.	Imp.
7	30 y.	6 w.	M.	L.	Complicated	Lateral splints, pad in axilla, &c.	U.	6 w.		Motions of joint perfect.	P.
8	23 y.	6 w.	M.		Complicated	Lateral splints.	U.	6 w.		Very slight bend.	P.
						SHAFT (UPPER THIRD).					
9	54 y.	3 y.	M.	R.	Simple transverse	Lateral splints and paste bandage.	U.			A case of fragilitas ossium; 18 months after, he broke the left humerus in its lower third; again he broke his right arm in its middle after 18 mos.	P.
10	11 y.	8 w.	M.		Simple	Lateral splints.	U.	8 w.			P.
11	30 y.	2 m.	M.	L.	Simple and oblique	Extension during three days; lateral splints; paste bandage.	U.	38 d.		Complicated with delirium tremens.	P.
12	38 y.	6 m.	M.	L.	Simple and oblique	Lateral splints.	U.	5 m.	½ in.	Use of limb perfect.	Imp.
13	35 y.	22 d.	M.	R.	Complicated	Lateral splints; gutta percha and paste splints.	N. U.			Died on 22d day.	Imp.
						MIDDLE THIRD.					
14	56 y.	1 y.	M.	R.	Simple	Lateral splints.	U.				P.
15	18 y.	25 y.	M.	L.	Simple	Lateral splints, &c.	U.				P.
16	Birth	10 m.	F.	L.	Simple and trans. congenital	Lateral splints.	U.	14 d.			P.
17	45 y.	1 y.	M.	R.	Simple and trans. syphilitic		U.	4 m.			P.
18	63 y.	2 y.	M.	R.	Simple		U.		1 in.		Imp.
19	33 y.	30 y.	M.	L.	Simple	Lateral splints.	U.		½ in.		Imp.
20	13 y.	5 w.	M.		Simple and oblique		U.		½ in.		Imp.
21	35 y.	5 m.	M.	R.	Simple		N. U.			Anchylosis.	Imp.
22	35 y.	6 m.	M.	L.	Simple	At first, right angled splint; subsequently, straight position.	U.			Union delayed.	P.
23	30 y.	2 m.	M.	R.	Comminuted	Long gutta percha splint, sling, &c.	U.				P.

ABOVE BASE OF CONDYLES (LOWER THIRD).											
							RESULT.				
No.	Age when it occurred.	Time since it occurred.	Sex.	Right or left side.	Character of the fracture.	TREATMENT.	United or not.	When united.	Amount of shortening.	Remarks.	Perfect or imperfect.
24	55 y.	2 y.	M.	L.	Simple	Lateral splints.	U.			Fragilitas ossium.	P.
25	3 y.	3 m.	F.	R.	Simple		U.				P.
26	4 y.	20 y.	M.		Simple		U.				P.
27	18 y.		M.		Simple	Starch and pasteboard splints.	U.	30 d.	¼ in.		Imp.
28	32 y.	15 y.	M.	R.	Simple		U.			Slight anchylosis.	Imp.
29	40 y.	4 y.	M.		Simple and oblique	Lateral splints.	U.	40 d.		Elbow was stiff a long time; motions now nearly restored.	Imp.
30	7 y.	15 y.	M.	L.	Simple	Lateral splints.	U.		½ in.	Arm bent, weak, and some wasted.	Imp.
31	30 y.	1 m.	M.	L.	Simple and ob.	Lateral splints.	U.	30 d.	1¼ in.		Imp.
32	30 y.	2 m.	M.	R.	Comminuted	Long gutta percha splint, sling, &c.	U.				P.
33	30 y.	6 m.	M.	L.	Compound	Angular splint.	N. U.		½ in.	Unsuccessful attempt to unite the bones by an operation.	Imp.
34	25 y.	2 y.	M.	R.	Compound, commin. and complic.		U.		1 in.	With unreduced dislocation of shoulder joint.	Imp.
BASE OF THE CONDYLES.											
35	6 y.	3 y.	M.	R.	Simple and ob.	Felt and paste.	U.	11 d.			P.
36	4 y.	3 m.	M.	R.	Simple and ob.		U.	28 d.		Partial anchylosis.	Imp.
37	6 y.		M.	R.	Simple		U.				
38	60 y.	7 m.	M.	R.	Simple		U.		½ in.	Upper fragment behind lower; anchylosis, &c.	Imp.
39	9 y.	2 m.	M.		Simple		U.				Imp.
40	8 y.	1 y.	M.	L.	Simple and oblique	Right-angled splint.	U.		1 in.	Great deformity and paralysis of arm; prosecution.	Imp.
41	4 y.	23 y.	M.	L.	Simple		U.			Deformity; pain, numbness, &c., after 23 years.	Imp.
42	2 y.	3 y.	F.	L.	Compound, commin.	Splints, &c.	U.	6 m.	½ in.	Anchylosis, &c.	Imp.
43	35 y.	3 y.	M.		Compound, commin.		U.		¾ in.	Partial anchylosis.	Imp.
44	7 y.	17 y.	M.		Compound, commin.		U.				P.
INTERNAL CONDYLE.											
45	6 y.	7 y.	M.		Simple, apophysis	Paste bandage after 7th day.	U.				P.
46	12 y.	38 y.	M.		Simple		U.			Anchylosis for 6 mos.	P.
47	11 y.		M.	L.	Simple, apophysis	Right angled splint, &c.	U.				P.
48	6 y.	3 m.	M.		Simple and into joint		U.			Anchylosis.	Imp.
49	9 y.	16 y.	M.	R.	Simple		U.			Elbow stiff one year; fragment displaced forward; use of arm now perfect.	Imp.
50	14 y.		M.	R.	Simple						

INTERNAL CONDYLE—*Continued.*

No.	Age when it occurred.	Time since it occurred.	Sex.	Right or left side.	Character of the fracture.	TREATMENT.	RESULT.				
							United or not.	When united.	Amount of shortening.	Remarks.	Perfect or imperfect.
51	15 y.	3 m.	M.	R.	Simple; apophysis	No splints.	U.			Fragment displaced downwards 1¼ inches; partial anchylosis; prosecution, &c.	Imp.
52	11 y.	1 y.	M.	L.	Simple and into joint		U.			Fragment displaced upwards ¾ inch; anchylosis.	Imp.
53	9 y.	6 y.	M.	L.	Simple; apophysis		U.			Fragment displaced downwards ¼ inch; anchylosis, &c.	Imp.
54	8 y.		M.	R.	Simple and into joint	Angular splint, starched bandage, &c.	U.			Anchylosis.	Imp.
55	18 y.	5 y.	M.	R.	Into joint; complicated with dislocation		U.			Fragment displaced downwards and forwards ½ in.; deformity.	Imp.
EXTERNAL CONDYLE.											
56	4 y.	1 y.	M.	L.	Simple; into joint		U.			Condyle projects to radial side; forearm deflected to ulnar side; very little anchylosis.	Imp.
57	5 y.	4 y.	M.	L.	Simple; into joint	Gutta percha, &c.	U.			Condyle projects to radial side; forearm deflected to radial side; anchylosis.	Imp.
58	88 y.	2 m.	F.		Simple		U.			Condyle displaced 6 lines; anchylosis.	Imp.
59	7 y.	4 y.	M.	L.	Simple		U.			Condyle projects a little forwards, and forearm is deflected outwards; very slight anchylosis.	Imp.
60	8 y.	2 m.	M.	L.	Simple	Angular splint.	U.			Condyle projected to radial side and a little backwards; anchylosis.	Imp.
61	5 y.	20 y.	M.		Simple		U.			Condyle projects to radial side; partial anchylosis, &c.	Imp.
62	5 y.	8 m.	M.		Comminuted	With arm nearly straight.	N. U.			One fragment not united; use of arm perfect.	Imp.
63	11 y.	1 y.	M.	L.	Complicated with dislocation of radius backwards		U.			Motions of arm perfect, but radius remains unreduced.	Imp.
BETWEEN THE CONDYLES.											
64	3 y.	18 y.	M.	L.	Simple		U.			Arm shortened ¾ inch; internal condyle projects; partial anchylosis.	Imp.
65	10 y.	7 y.	M.	L.	Simple	Angular splint.	U.			Condyles spread, and internal condyle carried backwards and inwards; forearm deflected inwards.	Imp.
66	44 y.	6 y.	F.	R.	Comminuted	Angular splint; gutta percha, &c.	U.			Slight anchylosis, &c.	Imp.
67	35 y.	12 y.	M.	L.	Compound, commin.		U.			Partial anchylosis, &c.	Imp.

REMARKS.

Of sixty-seven fractures of the humerus, thirteen occurred through some portion of the upper third, ten through the middle third, and forty-four through the lower third. Or, if we reject fractures of the head and condyles, twelve occurred through the upper third, ten through the middle third, and twenty-one through the lower third. An observation which is in contrast with the statement made by Amesbury, and which has been repeated by Lizars, B. Cooper, Fergusson, Gibson and others, that the most common situation of fractures of the humerus is through the middle third of the bone.

Of the fractures of the upper third, one was a fracture through the tuberosities, or a separation of the epiphysis. In this case union had not occurred five months after the injury was received, and the arm was nearly powerless. Seven occurred through the surgical neck, of which four have resulted in perfect limbs, and three are more or less deformed; but of the whole number only five were ever displaced, and of these five only two are perfect. In two of the imperfect cases, both fragments are displaced forwards; in one union has not occurred, and the lower fragment is also displaced forwards. In none of the cases, except where union has not occurred, are the functions of the arm impaired.

The proportion of the cases in which the fragments were displaced at first, is much greater than was observed by Malgaigne, who remarks that in more than twenty cases that he had seen there were but two examples of sensible and recognizable displacement; in a great majority of cases the fragments being retained in place by the resistance of the periosteum and of the long tendon of the biceps.

In three of my cases the lower fragment is displaced forwards, and in one case the upper fragment is thrown in the same direction. Desault has seen them both thrown backwards, Dupuytren, Paletta, Duret and others, have seen them pushed outwards. Others still more frequently have seen the fragments directed forwards; and Sir Astley Cooper declares that with infants this direction is constant; a statement which Malgaigne calls in question, he having seen the lower fragment most often drawn inwards towards the axilla. Others have observed that the lower fragment is generally drawn inwards while the upper is carried outwards, an observation which I have not confirmed.

With the exception of the two lads, one of whom was twelve years old, and the other fifteen, all the cases occurred in adults, and two in the persons of old men. This accords more nearly with the observations of Malgaigne than of Sir Astley Cooper. Sir A. Cooper declaring these fractures to be most common in infancy, while Malgaigne has never seen a case in a person under fifty-three years.

In addition to these two forms of fracture of the upper end of the humerus, in illustration of which I have furnished the foregoing cases, other forms have been described by surgeons, such as, 1st. Fractures of the anatomical neck (intracapsular) and not impacted. 2d. Fractures of the anatomical neck and impacted. 3d. Fractures of the great tuberosity, or of both tuberosities. 4th. Extra-scapular fracture and impacted.

I have recorded only one case of separation of the epiphysis, and seven of fractures of the surgical neck, but not one of either of the other varieties. The museums in this country, however, it will be seen, furnish several specimens of all these varieties, if, indeed, I except fractures of the great and lesser tuberosities, of which particular accident I have no precise information or knowledge. For much that is new and valuable on this subject I will refer the reader to that excellent treatise on "Fractures in the Vicinity of Joints, &c.," by Dr. Smith, of Dublin; and I beg only permission in this place to quote a few of his conclusions, such as may be considered pertinent to the object of this paper.

"The following conclusions may, I think, be legitimately drawn from what has been stated in the preceding pages:—

"When there is much displacement of the tubercle, in consequence of the rupture of the fibrous and tendinous structures which invest it, ligamentous union is more likely to be the result than osseous.

"In the former it is generally the inferior fragment which penetrates the superior, while, in the latter, the head of the bone is driven into the lower fragment.

"The intracapsular impacted fracture is generally accompanied by a fracture of one or other, or of both tubercles, and is so far analogous to the extracapsular impacted fracture of the neck of the femur, with the fracture of one or other, or of both trochanters.

"Each variety is capable of uniting by bone.

"In the intracapsular variety, the circumstance of the fracture being accompanied by impaction, materially increases the probability of the occurrence of osseous consolidation.

"When osseous union occurs in this variety of fracture, the process of reparation is accomplished by the lower fragment principally.

"In the intracapsular fracture, without impaction, the head of the humerus may perish from want of nutrition.

"In such cases, disorganization of the joint may ensue, as the result of the processes, by which the elimination of the dead bone is accomplished.

"In the intracapsular fracture the head of the bone may become reversed in the articulation, and its cartilaginous surface be brought into contact with the broken surface of the lower fragment.

"In the intracapsular impacted fracture the deformity is greater than in the extracapsular.

"Each variety of the impacted fracture unites with deformity.

"In the intracapsular impacted fracture, the removal of the deformity would diminish the probability of the occurrence of osseous consolidation.

"The chief diagnostic signs of the separation of the superior epiphysis of the humerus, are, an abrupt projection beneath the coracoid process caused by the upper end of the lower fragment, and the immediate recurrence of the deformity when the means employed for its reduction cease to be in operation.

"There is no fracture incidental to the upper end of the humerus, in which it is more difficult to maintain the fragments in their proper relative position.

"The supposition that, in this injury, the tubercles form a portion of the lower fragment, involves an anatomical error, the line of junction of the epiphysis with the shaft being below these processes." (*A Treatise on Fractures in the Vicinity of Joints*, &c., by Robert Wm. Smith. Dublin, 1854, pp. 207–8.)

In two of the cases of fractures of the upper end of the humerus, mentioned as being found in our museums, suppuration ensued, and the necrosed bone was successfully removed by that distinguished operator, Dr. Brainard, of Chicago. In Specimens 6 and 7, also, no union occurred, but union by bone occurred in the remaining six.

Specimen 2, of double fracture, presents a curious turning of the shaft of the bone upon its axis in consequence of the action of the scapular muscles.

Specimens 8 and 10, owned respectively by Charles A. Pope, of St. Louis, and Charles Gibson, of Richmond, present the most *bizarre* displacements. In the one case the head is completely reversed in the socket, and in the other it is set at right angles with the shaft. Displacements which find their parallel in a specimen of impacted fracture which Dr. Smith laid before the Pathological Society of Dublin, in 1843, and which he has particularly described in his work on *Fractures*, &c., pp. 193–196. Nélaton, also, p. 730, refers to a similar specimen which he has seen in the possession of M. Dubled. Smith mentions also a case, p. 197, in which the position of the head of the bone resembled specimen 10; and of this form of displacement, Nélaton, p. 730, says: "Malgaigne showed lately a specimen to the Academy. Indeed, I think it is, probably, the same which Malgaigne has himself described on p. 529 of his volume on *Fractures*, and which is represented in Pl. V. Fig. 2, of the same volume."

In specimens 1 and 2 alone is seen that irregular deposit of ensheathing callus, or those osteophites which are so commonly found on the margin of the lower fragment when the anatomical neck is broken. It will be remarked that these are the only cases recorded as intracapsular.

All of these fractures occurred in adults.

Perhaps no place will be more appropriate than this to speak of the difficulty of diagnosis in fractures about the joints, and especially in fractures occurring in the vicinity of the shoulder-joint; a difficulty so serious as to materially embarrass the surgeon in his prognosis, and which, it must certainly not be denied, diminishes the value of my own conclusions, as based upon my recorded cases. It is only, after all, by an examination of a great number of cases both before and after death, that we shall ever arrive at a complete solution of these difficult questions. To this point already the labors of Sir Astley Cooper, R. Smith, Key, and others have been especially directed, yet the constant mistakes committed to-day by the most experienced surgeons, not to speak of those acknowledged by Sir Astley himself, testify to the imperfection of our knowledge.

Says Nélaton, speaking of the fractures of the neck and head of the humerus: "Mais il n'est peut-être pas possible de distinguer entre elles les diverses variétés de cette fracture; Boyer, qui a plusieurs fois constaté par l'autopsie des fractures du col anatomique, dit que, pendant la vie des blessés, il lui avait eté impossible d'assurer du lieu précis où était située la fracture."[1]

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[1] Elémens de Pathologie, tom. i. p. 731.

Says Mr. Johnson, in a review of a memoir entitled *Diagnosis of Dislocations and Fractures of the Upper Extremity of the Humerus*, by M. Le Baron Dupuytren, "It is perfectly undeniable that fractures of the upper extremity of the humerus, and dislocations of the head of that bone, especially dislocations into the axilla, are at times confounded with, and mistaken for each other, even by those whose experience is great; we allude to our hospital surgeons. If such mistakes, then, occur with those whose opportunities of practice are considerable, *à fortiori*, how much more frequent must they be amongst those who have few or no such opportunities, and in country practice in particular. The question, indeed, need not be begged, for the fact, as so put, is unhappily notorious."[1]

Dupuytren reports several cases, from the practice of Hôtel Dieu, which illustrate the difficulty of diagnosis. In one case, a case of fracture near the head of the bone, with, also, actual dislocation of the head inwards and forwards, Dupuytren, who saw the patient on the first day, diagnosed a fracture only; on the third day he was in doubt, and on about the eighth day he discovered the true state of things. It does not appear, however, that the dislocation was ever reduced. In a second case the surgeon who first saw the patient diagnosed a mere contusion. On the third day many at the Hôtel Dieu thought it a dislocation, but Dupuytren determined that it was a fracture of the head of the bone. In the third case, one year had elapsed since the occurrence of an accident which a surgeon called a dislocation, and which he believed he had reduced, but M. Breschet discovered that it had been a fracture, and that the fragments remained displaced. The fourth case was also supposed at first to be a dislocation forwards, which the surgeon believed he had reduced. Two other surgeons subsequently attempted reduction, under the impression that it was an unreduced dislocation, and at the end of a month he came to Hôtel Dieu, where the accident was recognized as a fracture with displacement. Case four was more remarkable still. The patient, Marie Valletier, fell and injured her left shoulder, on the 26th of Jan. A surgeon, to whom she applied the next morning, said that nothing was amiss. On the 28th, the surgeons at Hôtel Dieu discovered the head of the left humerus in the axilla. M. Dupuytren now ascertained, also, that she had a dislocation forwards of the right humerus, and a fracture of the right femur, both of which had occurred twelve years before, and having been overlooked by the surgeon, remained unreduced. In the fifth case, on the third day after the accident, M. Dupuytren himself believed at first it was a dislocation, but finally ascertained that it was a fracture. Two more cases are related, one in which the surgeons at Hôpital St. Louis mistook a fracture for a contusion, and one in which a private surgeon committed the same error, both of which Dupuytren corrected on the eighth day. To these the reviewer adds, also, two similar cases which had come under his own observation, in one of which the surgeon twice attempted reduction of dislocation of the shoulder, when, in fact, there was probably a fracture of the surgical neck. The fragments were left unreduced, and yet "this surgeon," he reremarks, "deservedly ranks among the highest in town." An examination of the memoir shows, also, that even where Dupuytren was able to diagnose correctly these accidents, he was frequently unable to restore the displaced bones to position, or to retain them in place when reduced.

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[1] Med.-Chir. Rev., vol. xiv, Analyt. Series (1828), p. 133.

Mr. Key, in the ninth volume of the same journal, has recorded a case of fracture of the cervix humeri, which had been overlooked, and in which there was considerable displacement and non-union at the end of six weeks. He also declares "that it sometimes requires a very accurate examination to detect fracture of the cervix humeri, on account of the little displacement which occurs."

Says Mr. Smith: "It has been justly remarked by Dupuytren, that all solutions of continuity of bones in the vicinity of joints, give rise to numerous errors in diagnosis, and the observation applies with peculiar force to the injuries which occur in the immediate neighborhood of the scapulo-humeral articulation.

"Much, it is true, has been already done, both in this country and abroad, towards elucidating their nature, but every experienced surgeon can recall to his recollection cases of injuries of the shoulder, in which he has felt the utmost difficulty in arriving at a conclusion as to the nature of the accident."[1]

I have multiplied these quotations because it has occasionally happened to me to see the surgeon severely blamed for errors of diagnosis in relation to injuries about this joint, and also because I would like to impress upon surgeons the necessity of studying the diagnostic signs of these various accidents with great care. If any are inclined to this study, I would refer them especially to the memoir of Dupuytren, already quoted, to the excellent treatises of

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[1] Op. cit., p. 176.

Sir Astley Cooper and Robert Smith, and to the two volumes of Malgaigne, which treat respectively of fractures and of dislocations.

The remaining five cases of fractures through the upper third, occurred below the surgical neck; of these, three cases are recorded as perfect, and two as imperfect. Of the perfect, Case 9 was a transverse fracture occurring from muscular action, and was connected with a fragilitas ossium. This patient had subsequently the same arm broken through its middle third (Case 14), and, still later, the opposite arm through its lower third (Case 24). There was no tendency in either case to lateral displacement, consequently no overlapping of the fragments, the soft tissues immediately about the bone being but little, if at all, disturbed. Case 17 occurring in the middle third, a result of secondary lues, presented also the same peculiar features.

Of the two imperfect cases one was complicated, and the patient died of tetanus on the 22d day; and in the other, union was delayed five months, but the bone having finally united with slight shortening, the use of the limb was unimpaired; so that of these five patients, all, except the one who died, recovered eventually the perfect use of their arms.

Of the forty-four fractures of the lower third, ten occurred through the shaft at the base of the condyles, eleven higher up, eleven through the internal condyle, eight through the external condyle, and four across the shaft and through the condyles at the same time.

Of the fractures of the shaft above the base of the condyles, four are perfect, and seven imperfect; of the four perfect, one was a case of fragilitas ossium, already alluded to, and two occurred in infants.

Of the seven imperfect results, one is without union, five are with more or less anchylosis of the elbow-joint, and five are shortened.

In Case 31 the lower fragment is in front of the upper fragment. The arm was broken obliquely at two points in Case 32, but it has united without shortening or deformity.

Of the ten fractures occurring just above the condyles ("fractures de l'extrémite inférieure de l'humerus" of Dupuytren, and "fractures sus condyliennes de l'humerus" of Malgaigne), eight occurred in children under nine years of age, and some of them may have been separations of the lower epiphysis. In five instances the upper fragment was found at the time of the fracture or subsequently, in front of the lower; in one case only, Case 38, the opposite condition is remarked.

Seven still continue imperfect; and at periods, since the fractures, varying from two months to twenty-three years, six are more or less anchylosed. In one case only is the anchylosis complete.

The eleven fractures of the internal condyle ("trochlea and epitrochlea" of Chaussier) occurred in children between the ages of six years and eighteen; of the whole number four are known to have been fractures of the condyle outside of the joint, or fractures of the apophysis, ("epitrochlea"), and four are known to have entered the joint (fracture of the "trochlea"). Of the fractures of the apophyses two are recorded as imperfect, because there remains a partial anchylosis; and two as perfect, because no anchylosis exists. In three of the four cases there was, however, a permanent displacement of the apophysis. In one instance, it is displaced slightly upwards and backwards, and in two cases it is very much displaced downwards.

This is the fracture, a fracture of the epitrochlea, which Granger first described in the *Edinburgh Med. and Surg. Journal*,[1] and which he thinks is produced by inordinate muscular action, and not by a blow received directly upon the elbow. I do not clearly understand what direction the displaced fragments usually took in the cases seen by him, but I presume that they were carried directly downwards, or perhaps in some cases slightly forwards or backwards, since while he always speaks of their being "retracted below the elbow-joint," he mentions also that in some cases the fragments rest in contact with the olecranon, and in some cases they are an inch removed from this process. It is only by this lateral, or backwards displacement, also, that any pressure could have been exercised upon the ulnar nerve, a circumstance which he met with no less than three times: in each of which three cases there was a numbness of the parts supplied by the ulnar nerve, accompanied with vesications. In Case 45, reported by myself, the epitrochlea seems to be carried very slightly upwards, as well as a little backwards, but in all the other cases the displacement is downwards. In no case have I noticed numbness or vesications from pressure upon the ulnar nerve. Of the four which are known to have broken into the joint, all are imperfect and all had anchylosis of the elbow-joint, extending from three months to five years, or longer. In one case the condyle is displaced upwards, and in one, complicated with a dislocation, it is displaced downwards and forwards. In one other case, in which the fact is not known whether the fracture entered the joint or not, the condyle is displaced forwards. In no one of all the six cases of displacement of the internal condyle or of its apophysis is the displacement backwards, except in Case 45 of fracture of the apophysis.

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[1] "On a Particular Fracture of the Inner Condyle of the Humerus." By Benjamin Granger, Surgeon, Burton-upon-Trent. Op. cit., vol. xiv. pp. 196–201. April, 1818.

B. Cooper, South, Sir Astley Cooper and others, speak of fractures of the internal condyle as very common, and more so than fractures of the external condyle, while Malgaigne has never seen a case of fracture of the inner condyle, and regards its occurrence as very rare. He has, however, seen occasionally fractures of the epitrochlea, an accident which one might well suppose would be not unfrequent, especially in children, since it is not completely united by bone to the condyle until about the seventh year, and it remains always quite prominent and exposed to injury, not to speak of its being sometimes broken, as Granger has suggested, by muscular action, in falls upon the hand.

Of eight fractures of the external condyle ("condyle and epicondyle" of Chaussier), seven occurred between the ages of four and twelve years, and one at the age of eighty-eight. In only two cases was the arm at the time of examination free from anchylosis (cases 62 and 63). In the first case no bony union had occurred, and I have suspected that the restoration of the arm to its complete functions was due, in some degree, to this mobility of the condyle; or perhaps it may have been only a fracture of the epicondyle, or of that portion of the condyle which lies without the capsule, in which case, either with or without bony union, the danger of anchylosis would be less than in fractures of the condyle communicating with the joint. But Malgaigne has never seen an example of this fracture, and notwithstanding considerable authority to the contrary, he doubts its possibility. In Case 63 the radius was also dislocated backwards and has never been replaced, but the functions of the arm are completely restored.

In two of the cases reported as anchylosed, I ought to remark, the arm was examined two months after the fracture, a period so near the time of the accident, that the final result could not be positively determined.

The fragment has almost always been found a little displaced; generally outwards or to the radial side, so as to increase the breadth of the elbow-joint; in one instance the displacement is forwards, and in one a little backwards. Bransby Cooper and Chelius declare that the fragment is generally drawn upwards and backwards. I have seen nothing to confirm this statement, yet my observations are too few to authorize me to question its accuracy.

In Case 56, when the arm is extended, the forearm becomes strikingly deflected to the ulnar side, occupying an angle with the humerus of about 15°. When the arm is flexed, the line of the bone is completely restored.

In cases 57 and 59, the same phenomenon exists, except that the deflection is to the radial side.

Dorsey[1] speaks of this lateral inclination as being always to the ulnar side, but does not designate to what particular fracture of the elbow it belongs. He has also described a splint, contrived by Dr. Physick, intended to remedy the deformity in question. (Pl. III., Figs. 1 and 2.) Chelius also speaks of the same deformity as occurring after fractures of the *internal* condyle; but while I have not seen the forearm thrown either way after a fracture of the internal condyle, I have seen it, as will be observed, deflected to the *radial* side in two cases of fracture of the *external* condyle, and to the ulnar side in one case of fracture of the same condyle, and in one other case of fracture between the condyles.

I am unable to find any explanation of the fact stated by Chelius, that the forearm is sometimes deflected to the ulnar side after fracture of the inner condyle, unless the entire trochlea has been broken off and carried upwards; but the deflection to the radial side seems to be a natural consequence of the obliquity of the trochlea, when the support of the radius is lost, whether the portion of the humerus upon which it moves is displaced or not. The direction of this obliquity is such that the smooth surface of the trochlea presents strongly to the radial side; and even in the normal state, extension of the forearm inclines the hand to the radial side.

Of four fractures traversing the shaft and penetrating between the condyles ("fracture des deux condyles"), all are marked imperfect. In three anchylosis exists in some degree. As I have just mentioned, also, in Case 65, straightening the arm throws the forearm strongly to the ulnar side.

Malgaigne (pp. 558, 559) has spoken of a remarkable phenomenon which he has occasionally observed after fractures about the elbow-joint, and of which he cites two examples, both of which he has illustrated by accurate drawings: "C'est une hypertrophie osseuse qui renfle au contraire certaines parties voisines, soit des fragments mêmes, soit des os contigus." In one example this hypertrophy occurred in both condyles, and in the upper ends of both radius and ulna. He has not yet observed this phenomenon in the bones of any other joint than the elbow-joint.

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[1] Elements of Surgery, Philada. ed., 1813, vol. i. p. 146.

It is not improbable that the same expansion or hypertrophy occurred in Case 57 of fractures of the humerus; a case of fracture of the external condyle. The specimen of fracture of the neck of the radius, of which I have given a drawing, illustrates also this peculiar pathological condition.

In fractures of the humerus, I have preferred generally a broad and thick splint of gutta percha, sufficiently long to extend from the neck to the wrist, moulded accurately, and applied to the shoulder, arm, and forearm, while the limb is flexed to a right angle, and while extension is being made upon the humerus. This being properly padded, and secured in place by rollers, I place the arm in a sling, beside the body. The sling must, however, be so arranged, by being looped under the wrist, and not under the elbow, as that the weight of the elbow and lower part of the arm may aid in making extension. In Case 11, I attempted permanent extension with a gutta percha splint in the axilla. Other surgeons have sought to make permanent extension in certain fractures of the humerus, by various contrivances. Mr. Lonsdale had constructed an instrument which might be lengthened or shortened to suit the case; it was made of steel, and was worked with a screw operating upon cogs in a sliding bar; resembling, in some points, the humerus portion of Jarvis's adjuster. I think the same apparatus might easily be adapted to any form of arm splint.

In the second London edition of a series of Plates, illustrating the causes of displacement in fractures of the extremities, by S. W. Hind (p. 19), is a drawing of an apparatus constructed by the author for the same purpose, which is very simple, and in some respects more complete than Lonsdale's. Dr. Charles Winne, of this city, has also shown me one of Welch's angular splints, to which he has had adapted a movable crutch, and which, he informs me, he has employed twice, in such fractures of the humerus as seemed to demand permanent extension, with very satisfactory results.

I believe that all these contrivances may prove occasionally useful, but the common experience of surgeons has shown how difficult it is to accomplish much extension by means of pressure in the axilla; a mode, too, which I think must be inadmissible when the fracture is near the upper end, since the pressure by the crutch head upon the pectoralis major and latissimus dorsi, which constitute the margins of the axilla, must tend to displace the fragments upon which they act inwardly; and which can seldom be applied with much force to fractures near the condyles, on account of the probable existence of inflammation and swelling about the joint.

Malgaigne, when speaking of the apparatus contrived by Lonsdale, remarks: "Que le chirurgien ne perde jamais de vue que l'extension permanente est une resource toujours dangereuse, souvent inutile, et qui exige dans son application beaucoup de réserve et de vigilance." (*Op. cit.*, tom. i. p. 541.)

Something may always be accomplished, when the patient is walking about, by allowing the elbow to escape from the sling, so that its weight shall make constant traction upon the lower fragment; and the plan which I shall hereafter suggest of treating certain cases of delayed union, namely: extending the arm at full length by the side of the body, so that the lower fragment shall receive the whole weight of the hand and forearm, might, perhaps, prove more efficient than either of the modes described.

The splints generally employed in this country, in fractures about the elbow-joint, are simple angular side splints, without joints, such as those recommended by Physick[1] (Pl. III., Fig. 1); angular pasteboard splints, felt, gutta percha, &c., or angular splints with a hinge, such as Kirkbride's[2] (Pl. III., Fig. 3), Thomas Hewson's,[3] Day's (Pl. III., Fig. 5), or Rose's (Pl. III., Fig. 4), or the more elegant and perfect angular splint of Welch (Pl. II., Fig. 2). For myself, I generally prefer gutta percha, moulded, and applied accurately to the limb; and this splint, or whatever other apparatus I employ, I take care to remove at a very early day—so early, indeed, as the seventh or eighth day, and to change the direction of its angle very frequently, giving each time to the elbow some passive motion. It is quite probable, however, that in a great majority of fractures of either the outer or inner condyle, the patient would suffer much less, and recover with quite as useful and perfect arms, if no splints whatever were employed. Nélaton and Malgaigne discourage their use in these fractures, since beyond the mere steadying of the elbow-joint, they can serve no practical purpose, and may, on the contrary, do considerable injury. Speaking of the fracture of the epitrochlea, Granger remarks: "This is the only instance of this accident out of five which I have seen, that the full range of flexion and extension of the forearm has not ultimately been obtained, or with so trifling an exception as not to be observable without close attention.

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[1] Elements of Surgery, by John Syng Dorsey, Philada. ed., vol. i. p. 145, 1813.

[2] Amer. Journ. Med. Sci., vol. xvi. p. 315.

[3] Note to Amer. ed. of Erichsen's Surgery, p. 211.

I have purposely avoided saying one word about replacing the detached condyle, and for these reasons: during the state of tumefaction which almost immediately follows this accident, no mechanical means could be successfully employed to retain these small fragments in place; and after it has subsided, it is usually too firmly fixed to allow it to be moved. Something may perhaps be accomplished by position and relaxation of the muscles, but I have found the effect of position also scarcely appreciable. In fact, I believe that, as a general rule, the less we interfere with the displaced fragments, the better for our patients, and for our own reputation.

The following remarks on a new mode of treatment in cases of delayed union of the humerus were made by myself to the "Buffalo Medical Association," and published in the *Buffalo Med. Journ.*, vol. x. p. 142; and, although I have not had any further opportunity to confirm the value of the suggestions there made, I still entertain a conviction that they will be found occasionally applicable.

"It has been observed by surgeons that non-union results more frequently after fractures of the shaft of the humerus than after fractures of the shaft of any other bone. This observation is confirmed by my own researches.

"Comparing the humerus with the femur, between which, above all others, the circumstances of form, situation, &c., are most nearly parallel, and in both of which non-union is said to be relatively frequent, I find that of forty-nine fractures of the humerus, four occurred through the surgical neck, twelve through the condyles, and twenty-nine through the shaft. In one of the twenty-nine, the patient survived the accident only a few days. In four of the remaining twenty-eight, union had not occurred after the lapse of six months, and in many more was it delayed considerably beyond the usual time. Two of the four were simple fractures, and occurred near the middle of the humerus; the third was compound, and occurred near the middle also; the fourth was compound, and occurred near the condyles.

"This analysis supplies us, therefore, with four cases of non-union, from a table of twenty-eight cases of fractures through the shaft.

"Of eighty-seven fractures of the femur, twenty occurred through the neck, one through the trochanter major, and one through the condyles. The remaining sixty-five occurred through the shaft and generally near the middle, and in not one case was the union delayed beyond six months.

"To make the comparison more complete, I must add that of the twenty-eight fractures of the shaft of the humerus, six were compound; and of the sixty-five fractures of the shaft of the femur, six were either compound, comminuted, or both compound and comminuted. The six compound fractures of the shaft of the humerus furnished two cases of non-union. The six cases of either compound or comminuted, or compound and comminuted fractures of the femur, furnished no case of non-union.

"I beg to suggest to the Society what seems to me to be the true explanation of these facts.

"It is the universal practice, so far as I know, in dressing fractures of the humerus, to place the forearm at right angles with the arm. Within a few days, and generally, I think, within a few hours, after the arm and forearm are placed in this position, a rigidity of the muscles and other structures has ensued, and to such a degree that, if the splints and sling are completely removed, the elbow will remain flexed and firm; nor will it be easy to straighten it. A temporary false anchylosis has occurred, and, instead of motion at the elbow-joint, when the forearm is attempted to be straightened upon the arm, there is only motion at the seat of fracture. It will thus happen that every upward and downward movement of the forearm will inflict motion upon the fracture; and, inasmuch as the elbow has become the pivot, the motion at the upper end of the lower fragment will be the greater in proportion to the distance of the fracture from the elbow-joint.

"No doubt it is intended that the dressings shall prevent all motion of the forearm upon the arm; but I fear that they cannot always be made to do this. I believe it is never done when the dressing is made without angular splints; nor is it by any means certain that it will be accomplished when such splints are used. The weight of the forearm is such when placed at right angles with the arm, and encumbered with splints and bandages, that even when supported by a sling, it settles heavily forwards, and compels the arm dressings to loosen themselves from the arm in front of the point of fracture, and to indent themselves in the skin and flesh behind. By these means, the upper end of the lower fragment is tilted forward. If the forearm should continue to drag upon the sling, nothing but a permanent forward displacement would probably result. The bones might unite, yet with a deformity.

"But the weight of the forearm under these circumstances is not uniform; nor do I see how it can be made so. It is to the sling that we must trust mainly to accomplish this important indication. But you have all noticed that the tension or relaxation of the sling depends upon the attitude of the body, whether standing or sitting —upon the erection or inclination of the head, body, or upper extremities. It is probable, gentlemen, that you have made the same observation.

"From this, and many similar facts, I have been led to suspect, for a long time, that motion has had less to do with non-union than was generally believed.

"I find, however, no difficulty in reconciling this suspicion with my doctrine in reference to the case in question; and it is precisely because, as I have already explained, the motion, in case of a fractured humerus, dressed in the usual manner, is peculiar. In a fracture of the clavicle through its middle third (its usual situation), the motion is upon the point of fracture, as upon a pivot; although, therefore, the motion is almost incessant, it does not essentially, if at all, disturb the adhesive process. The same is true in nearly all other fractures. The fragments move only upon themselves, and not to and from each other. I know of no complete exception but in the case now under consideration.

"Aside of any speculation, the facts are easily verified by a personal examination of the patients during the first or second week of treatment, or at any time before union has occurred, both in fractures of the humerus and clavicle. The latter is always sufficiently exposed to permit you to see what occurs, and as soon as the swelling has a little subsided in the former case, you will have no difficulty in feeling the motion outside of the dressings, or perhaps in introducing the finger under the dressings sufficiently far to reach the point of fracture. I believe you will not fail to recognize the differences in the motion between the two cases.

"Such, gentlemen, is the explanation which I wish to offer for the relative frequency of this very serious accident—non-union of the humerus.

"I know of no other circumstance or condition in which this bone is peculiar, and which, therefore, might be invoked as an explanation. Overlapping of the bones, the reason assigned by some writers, is not sufficient, since it is not peculiar. The same occurs much oftener, and to a much greater extent, in fractures of the femur, and equally as often in fractures of the clavicle; yet in neither case are these results so frequent. Nor can it be due to the action of the deltoid or of any other particular muscles about the arm, whether the fracture be below or above their insertions, since similar muscles, with similar attachments on the femur and on the clavicle, tending always powerfully to the separation of the fragments, occasion only deformity, but not non-union.

"If I am correct in my views, we shall be able sometimes to consummate union of a fractured humerus where it is delayed, by straightening the forearm upon the arm, and confining them to this position. A straight splint, extending from the top of the shoulder to the hand, made of some firm but moulding material, and made fast with rollers, will secure the requisite immobility to the fracture. The weight of the forearm and hand will only tend to keep the fragments in place, and if the splint and bandages are sufficiently tight, the motion occasioned by swinging the hand and forearm will be conveyed almost entirely to the shoulder-joint. Very little motion, indeed, can in this posture be communicated to the fragments, and what little is thus communicated, is a motion which experience has elsewhere shown is not disturbing or pernicious, but a motion only upon the ends of the fragments as upon a pivot.

"I do not fail to notice that this position has serious objections, and that it is liable to inconveniences which must always, probably, prevent its being adopted as the usual plan of treatment for fractured arms. It is more inconvenient to get up and lie down, or even to sit down, in this position of the arm; and the hand is liable to swell. But I shall not be surprised to learn that experience will prove these objections to have less weight than we are now disposed to give them. Remember, the practice is yet untried—if I except the case which I am about to relate, and in which case, I am frank to say, these objections scarcely existed. The swelling of the hand was trivial, and only continued through the first fortnight, and the patient never spoke of the inconvenience of getting up or sitting down, or even of lying down." (See Case 22.)

CHAPTER VIII.

RADIUS.

Upper Third.

Neck.

CASE 1. *Supposed fracture. Reduction and subsequent displacement. Result imperfect.*

Elizabeth Fowler, of Phelps, N. Y., æt. 11, fell from a tree and fractured her right arm. Dr. Bannister, who regarded it as a fracture of the neck of the radius, reduced the fragments, and applied two splints, with compresses, rollers, &c., and placed the forearm at a right angle with the arm. At the end of two weeks, the dressings were removed. She could then flex and extend the arm very well. The forearm was again dressed, but only one splint was employed. Twenty-eight days from the time of the accident, all dressings were finally removed; and, at this time, no projection at the seat of fracture was noticed. The hand was, however, proned. From this day, the forearm was gradually straightened upon the arm for several days. It was then again flexed partially, but after this it could not be again made straight. (Such is the statement made by the father.)

I examined the arm fifteen months after the accident, and found only slight power of flexion and extension; but this power was steadily improving. The hand was forcibly proned, and could not be supined. A projection existed in front of the elbow at the supposed seat of fracture, which might have been the head of the radius, a callus over the seat of fracture, or the fragments displaced forwards. I think it was the latter; and, if so, it was probably produced by straightening the arm on the fourth week, when the biceps was contracted, and whilst the bond of union between the fragments was not firm.

CASE 2. *Supposed fracture, probably complicated with fracture of the external condyle. Union with deformity.*

Gilbert Sole, of Darien, Genesee Co., N. Y., æt. 8, fell, while sliding down a hill, in Dec., 1854. No surgeon was employed until five weeks after the accident, when he was seen by J. C. Holt, of Bennington, Wyoming Co., N. Y.

Ten weeks after he received the injury, his parents brought him to me. The left arm was then anchylosed at right angles. The fractured ends of the radius seemed to be displaced forwards, and, as I believed, could be very distinctly felt. The hand was proned, and could not be supined. I think the external condyle was broken also, and slightly displaced.

CASE 3. *Supposed fracture, complicated with dislocation of the upper end of the ulna. Deformity and maiming.*

John R. Amsdel, of White's Corner, æt. 25. It was treated by Dr. Nott, of Buffalo.

I examined the arm six months after the accident. The upper end of the lower fragment appeared to be displaced forwards. Very little motion at the elbow-joint, and both pronation and supination are lost.

Middle Third.

CASE 4. *Simple fracture. Union without deformity.*

David Shortwell, of Saratoga Co., æt. 21, broke the radius near its middle. It was treated by a surgeon at Saratoga.

Fifty years after the accident, the arm was in every respect perfect, except that the power of pronation and supination was restricted.

CASE 5. *Simple fracture. Union with deformity.*

Wm. Lynn, of Buffalo, æt. 35, broke the radius, July 22d, 1850, near the lower end of the middle third.

I dressed the arm carefully with two broad splints, on the same day on which it was broken. Five days after, I opened the dressings and found the fragments in place; the same observation was made on the twenty-first day. At this time, I removed the dorsal splint, and continued only the palmar, thinking that the union was sufficiently firm to warrant this procedure.

One week later, I found the splints somewhat loose, and the fragments projecting forwards. I requested him to permit me to straighten it by force, but he declined. I then applied a compress over and near one end of the salient fragments, and secured it in place with a splint and roller. At the next dressing, seven days later, I could not feel the projection; but a few days later it was very manifest.

Twenty-two weeks from the date of the fracture, Lynn had his arm nearly torn off in a railroad accident, and I amputated it near the shoulder-joint.

On examining the radius, I found the projection was due to a forward displacement of the fragments, and not to a callus. (See specimen in my collection.)

My impression is that the fragments were never completely replaced, or, if they were, that they soon became displaced. Yet I was very careful and diligent to accomplish a complete reduction, and to retain them in position; and, if the displacement existed prior to the twenty-first day, it was overlooked because the effusion of lymph and serum among the tissues rendered it impossible to recognize it. I say this, because I am unwilling to admit any degree of carelessness or lack of attention on my part. Almost every day I had examined the limb, and as often as every fourth or fifth day I had removed and renewed the dressings.

The probability is, nevertheless, that it did exist, and that only when the swelling subsided it became manifest. It is not only the superficial swelling which has thus frequently deceived me, and induced me to think a limb was straight when it was not, but it is especially that deeper and more firm effusion in the immediate neighborhood of the fracture, and which often remains long after the superficial tumefaction has subsided.

Lower Third (*above line of Colles' Fracture*).

CASE 6. *Simple fracture. Result perfect.*

E. J. Schoonmaker, of Seneca County, N. Y., æt. 16, fell from a carriage, striking upon the back of his hand, and breaking the radius obliquely, about three inches from its lower end. The lower end of the ulna was also slightly displaced. A surgeon reduced the fracture within eleven hours after the accident, and applied splints, &c.

Six years after this I examined the arm. The seat of fracture could be plainly felt, but the fragments were perfectly in place. The arm is as perfect as before.

CASE 7. *Simple fracture. Result perfect.*

Lyman J. Barrows, of Utica, æt. 12, was struck by the fore foot of a horse, breaking his left arm, and producing in the fall a dislocation of the left tibia, with a fracture of the corresponding fibula. The radius was broken four inches above the wrist. Dr. Ford, of Cazenovia, dressed the arm with an anterior and posterior splint.

Ten years after, when Mr. B. was under my instructions as a student of medicine, the radius was slightly bent towards the ulna at the seat of fracture. In other respects it was perfect, and the arm was as useful as the other.

CASE 8. *Simple fracture. Result perfect.*

Elisha Standish, of Livingston Co., æt. 39, broke his radius through the lower third.

It was dressed by a surgeon in Livingston Co., and eight years after I could find no traces of the accident.

CASE 9. *Simple fracture. Result perfect.*

Preston Brooks, æt. 15, broke the radius four inches above the wrist. Dr. Wallis, of Aurora, dressed the arm.

Three months after, the seat of fracture could not be discovered.

CASE 10. *Simple fracture. Union with slight displacement.*

Geo. Vogel, æt. 30, admitted to Buffalo Hospital Nov. 2, 1852, with a fracture at the upper end of the lower third of the right radius. The lower end of the ulna displaced to the ulnar side.

I reduced the fracture as well as I was able to do, and applied a gutta percha splint, and secured it with a paste bandage. I was unable, at the time, to prevent the broken ends from falling against the ulna.

The dressings were finally removed on the first of December. No mention is made of the condition of the fragments at this time, but I presume they were in the same position as when I dressed the arm at first.

Lower Third.

Near union of Epiphysis with Diaphysis (Colles' Fracture).

CASE 11. *Simple fracture. Result perfect.*

Thomas Burton, of Buffalo, æt. 22, fell, March 2, 1851, fifteen feet into the hold of a vessel. I was called about nine hours after the accident occurred. The left wrist was much swollen, and the radius broken about one inch and a half above the joint. The lower fragment was displaced forwards.

I reduced the fragments and applied two broad, well-padded straight splints.

Three months after the bones were united without displacement, but the wrist remained stiff.

CASE 12. *Simple fracture. Result perfect.*

Harvey Hibbard, æt. 14, broke the radius about one inch above the wrist. Dr. Henry Moore, of Manlius, N. Y., dressed the fracture.

Twenty-four years after the accident I find no traces of it.

CASE 13. *Simple fracture. Result perfect.*

Stephen Goodwin, Esq., of Auburn, æt. 15, broke his left radius just above the wrist.

It was treated by his father, who was a surgeon of great respectability, in Ontario Co., N. Y.

Twenty-five years after, I could find no traces of the accident.

CASE 14. *Simple fracture. Result perfect.*

Mrs. John Little, of Buffalo, æt. 43, fell, Feb. 9, 1852, and broke the radius about one inch from its lower end. The ulna was prominent below, and the hand fell backwards and to the radial side.

Dr. John Trowbridge was first called, but on the following day, at his request, I took charge of it. I reduced the fracture, and applied two straight, broad, firm, and well-padded gutta percha splints.

The result, after three months, was a perfect limb.

CASE 15. *Simple fracture. Result perfect.*

Mrs. Ellen Boyle, of Buffalo, æt. 38, fell, March 20th, 1856, with her left arm under her back and side, breaking the radius about three-quarters of an inch above the joint.

I was immediately called, and found the lower fragment carried back, the lower end of the ulna projecting in front. The wrist was already considerably swollen. I could not detect crepitus. By extension and pressure I reduced the fragments and applied a well-padded palmar splint, carved and shaped to the arm and hand. The next day I loosened the dressings.

March 27. At my request Dr. Ellory P. Smith took charge of the case, and after we had carefully examined the arm and found the fragments still apparently in place, Dr. Smith applied his curved splint constructed with a movable joint.

April 30, 1856. Dr. Smith has just removed the splint. Arm is perfect, save that a stiffness of the wrist-joint still remains.

CASE 16. *Simple fracture, without displacement. Union without deformity or maiming.*

John Ford, of Buffalo, æt. 40, January 27, 1854. A block of ice fell upon his right arm, breaking the radius near its lower end. He came to me on the same day. Motion and crepitus were distinct, but there was no discoverable displacement of the fragments.

I applied a curved splint to the palmar surface of the forearm and hand, which would incline the hand to the ulnar side.

Five weeks and one day from the date of the accident, I removed all dressings. The bone had united without deformity or maiming. No ensheathing callus could be felt around the seat of fracture.

CASE 17. *Simple fracture. Result perfect.*

A. Ellis, of Buffalo, aged about 35 years, fell, August 23, 1855, striking upon the palm of his left hand, and breaking the radius about one inch above the wrist-joint.

Ellis came immediately to me. The fracture was nearly transverse. The lower end of the upper fragment was quite prominent in front, the lower fragment and the carpus being carried back and a little outwards.

I reduced the bones easily by extension and pressure, and they showed no tendency to become again displaced. I applied a broad, straight, and well padded splint to the palmar surface of the forearm and hand.

On the 19th day, I found the fragments firm; but there was no ensheathing callus which could be felt, nor was there any detected subsequently. On this day I removed all splints and other dressings, only enjoining upon the patient great care in the handling of the limb.

Six weeks from the date of the accident, the wrist and hand were still somewhat swollen, and the joints stiff, but the fragments seemed in perfect line, and the hand not at all deformed.

CASE 18. *Simple fracture. Result perfect.*

Hugh O'Brien, of Buffalo, æt. 37, fell from a wagon, October 27,

1853. Arm dressed by Dr. Mixer. Admitted to the hospital on the 28th, and examined before the class on the 29th.

I found the radius broken nearly transversely about one inch above the articulation. Fragments very nearly in perfect position. I dressed the arm with two broad, straight, and well padded splints.

On the fourth day I removed one of the splints, and continued only the palmar.

November 10, he left the hospital, but returned on the 14th (eighteenth day). The fragments were now united, and no deformity remained.

CASE 19. *Simple fracture. United without deformity.*

Margaret Read, æt. 60, fell, September 23, 1855, striking on the palm of the right hand, breaking the radius about one inch from the lower end of the bone. I found her in the hospital, at the commencement of my service, October 1, 1855, one week after the accident. Dr. Ellory P. Smith, hospital surgeon, had reduced the fracture, and dressed the arm. The arm was dressed with two of Day's splints, one on the palmar and one on the dorsal surface; which were well padded, and neatly applied. Dr. Smith had not yet examined the fracture since it was dressed by himself, and he requested me to open it. We found the fragments displaced, so that the hand fell backwards and to the radial side, and the ulna was prominent below.

I immediately proceeded to make extension, at the same time that I pressed the lower fragment forcibly forwards; I succeeded, I think, in reducing the fragments. I then applied straight splints, well padded, instead of Day's splint.

On the 3d of October I loosened the dressings, which were quite snug, and found the fragments again out of place. Using still more force, and having again as I believe reduced the fragments, I dressed the arm as I had dressed it before.

October 18. The fragments had united, and without displacement. From this time only one splint was used, and on the 30th, the other splint was removed also.

She left the hospital November 4, with her hand and wrist slightly swollen, and with considerable stiffness at the wrist and elbow joints.

CASE 20. *Simple fracture. Union with slight deformity.*

H. W. B., of Buffalo, æt. 17, fell in a gymnasium, striking upon the palms of both hands. He was seen soon after by Dr. G., who believed he had sprained both wrists, and did not apply splints. The next day he came under the charge of Dr. White, of Buffalo.

April 26, 1853. Dr. White brought him to my office. The fragments were then united. The ulna projected to the ulnar side, and the hand was inclined to the radial side.

September 10. No change in the form of the arm. Its motions are, however, perfect.

CASE 21. *Simple fracture. Union with deformity.*

Mrs. Margaret Doyle, æt. 25, fell, December, 1850, on the ice. She fell with her left hand a little back of her, but struck on the palm. A surgeon in Pittsford, Vt., dressed the fracture. He applied four narrow splints. Dressing continued eight weeks.

I examined the arm April 1, 1856. The lower fragment is displaced backwards, and a little supined, and the hand falls to the radial side. The lower end of the ulna projects in front. Pronation and supination are nearly perfect, but flexion at the wrist-joint is imperfect. Her arm is very weak, and occasionally painful.

CASE 22. *Simple fracture. Union with slight deformity.*

Mrs. Abner Birmingham, of Buffalo, æt. 25, was thrown from a load of wood, August 12, 1853, breaking her right radius near the wrist. The right leg was also severely injured, and was immediately amputated.

I applied to the palmar surface of the forearm a broad gutta percha splint, and inclined the whole hand to the ulnar side. Two months later, the hand was found to be inclined to the radial side, and the styloid process of the ulna was prominent. The wrist was also swollen in front, and above the annular ligament, the finger and wrist-joints were quite stiff, and she had no power of pronation or supination.

One year later, all the functions of the hand were restored, but the inward inclination of the hand remains.

CASE 23. *Simple fracture. Union with slight deformity.*

Henry Sherry, of Buffalo, æt. 45, broke the radius of the left arm by a fall upon the open palm, Feb. 2, 1854. The fracture was near the wrist.

Dr. Hackstein was called, and attempted reduction by powerful extension and counter-extension. He applied a palmar and dorsal splint. Treatment continued five weeks.

Eighteen weeks after, Sherry called upon me, complaining of his surgeon. The hand was inclined slightly to the radial side, and the ulna was projecting to the ulnar side. The wrist-joint remained rather stiff.

CASE 24. *Simple fracture. Union with deformity and maiming.*

Charles Stratton, of Buffalo, a healthy and temperate laborer, æt. 36, fell forwards from a wagon, striking upon the palm of his left hand. The accident occurred Nov. 22, 1854.

Stratton came immediately to my office, and I found the radius was broken a little more than one inch above the wrist-joint. I reduced the fracture, and applied a well-padded curved dorsal splint to the forearm and hand. I renewed the dressings on the 24th and 27th; and on the 29th, when I called, I found the arm much swollen. I could not ascribe this accident to the tightness of the dressings, nor to any act on the part of the patient. Its character was decidedly erysipelatous. I removed at once all of the dressings, and, laying the arm upon a broad board, covered with a cushion and a silk oil-cloth, I directed it to be kept wet with cold water. In a few days, the swelling subsided, and, finding that the patient was very careful with the arm, and that no displacement of the fragments had occurred, the splints and bandages were not re-applied. At the end of five weeks all dressings were discontinued. There was no ensheathing callus at this date, but the union was firm.

June 1, 1855. Six months after the accident, I found the arm perfectly straight, so that it was not possible to detect the place of fracture. The wrist-joint still remained quite stiff, and also the fingers, so that he was unable to flex them but moderately. There was no swelling or soreness, but he was unable to use his hands for purposes of labor.

One year from the accident he was still unable to work, but the hand was slowly improving.

CASE 25. *Simple fracture. Union with deformity.*

Mary Kelly, of Buffalo, æt. 60, fell, March 13, 1855, upon the sidewalk, breaking the left radius half an inch above the lower end. It was treated by Dr. Wm. Ring, of Buffalo, with Day's curved splint.

Mary called upon me, April 23, six weeks after the accident. The splint had then been removed two weeks. The arm was slightly swollen, and the wrist and finger-joints were stiff. The lower end of the ulna was prominent. The lower fragment, with the carpus, was inclined backwards, and the hand fell to the radial side.

CASE 26. *Simple fracture. Result nearly perfect.*

Mrs. H., of Chicago, Ill., æt. 56, fell, striking on her left hand, in 1853, breaking the radius about one inch above the joint. Dr. McVicker, of Chicago, dressed and treated the fracture. He applied pasteboard splints, and continued them six weeks.

I examined the arm two years after the injury was received, and found the hand inclined to the radial side, and the ulna prominent. The motions of the wrist-joint are now completely restored; but she can only partially flex her fingers.

CASE 27. *Simple fracture. Union with deformity.*

Joseph Brinstead, of Germany, æt. 10, broke the radius of the left arm near the wrist-joint. It was dressed and treated by a surgeon in Germany. Twelve years after the arm was broken he came under my care at the Buffalo Hospital, and I found the forearm shortened an inch, with the ulna displaced downwards towards the hand.

CASE 28. *Simple fracture. Result imperfect.*

Edson Knapp, of East Hamburg, N. Y., æt. 67, was thrown, Dec. 24, 1855, by a young steer, breaking the radius of the left arm one inch above the wrist. I saw Mr. Knapp twelve hours after the accident. Wrist much swollen and very painful. Hand and lower fragments carried backwards and to the radial side. With moderate force, I brought the fragments into form. Not much tendency to displacement. I applied a curved splint to the palmar side of forearm and hand, to which was subsequently added a dorsal splint.

The bones united in about the usual time, and with very little deformity.

CASE 29. *Simple fracture. Union with slight deformity, &c.*

Mrs. S. Hooper, of Black Rock, æt. 51, broke the right radius near the wrist in the spring of 1852. Dr. Dayton was employed.

About one year after the accident, Mrs. H. called upon me. I found the lower fragment slightly bent backwards at the seat of fracture, and the wrist-joint remaining quite stiff. The lower end of the ulna projects slightly to the ulnar side.

She complained of her surgeon; but I soon persuaded her that other surgeons, for whom she professed to have a great respect, were quite as unsuccessful in many cases.

CASE 30. *Simple fracture. Union with deformity, &c.*

Mrs. A. N. Larreau, of Buffalo, æt. 26, fell upon the palm of her left hand, and broke the radius near the lower end. Dr. Barnes, of Buffalo, was employed.

I examined the arm about four years after the accident, and found the hand inclined to the radial side, and the ulna projecting to the ulnar side. She complains that her surgeon did not "set" it right.

CASE 31. *Simple fracture. Union with slight deformity.*

Lucinda Adgel, æt. 48, broke her left arm Dec. 14, 1855, by falling and striking on the palm of her hand.

It was dressed immediately by Dr. James P. White, with two straight splints, and sent to the hospital.

Dec. 20. I removed and reapplied the dressings, substituting padded splints for those which were first applied.

Jan. 15. The fragments were united, and all splints and bandages were removed, except during the night.

21*st.* She left the hospital. There remained, I think, a slight bend at the seat of fracture, the hand falling a little to the radial side, and the lower end of the ulna projecting slightly. The wrist also was stiff, and the hand swollen.

CASE 32. *Simple fracture. Union with very slight deformity.*

Mrs. Ann Hunt, æt. 43, fell, Jan. 4, 1856, striking on the palm of her left hand, breaking the radius about one inch above the wrist-joint. Dr. E. P. Gray, of Buffalo, dressed the arm immediately, and sent her to the hospital.

I found the forearm covered with a roller, and supported by two of Day's carved splints—what Mr. Day calls a radial splint—being placed along the back of the forearm, by which the hand was thrown to the ulnar side, and a short carved splint in front, each padded with loose pieces of cotton batting.

On the following day, finding the dressing very painful, I substituted straight, broad, well-covered, and carefully padded splints. id not again apply the roller to the forearm, underneath the [illegible]

Jan. 12 (eighth day). I found the fragments were not in place, and, as the swelling was then much reduced, I resorted to considerable force to restore them to position; and, having succeeded, I applied curved splints to both palmar and dorsal surfaces, each of them being very heavily and carefully padded.

30*th*. The bandages were removed, and tapes substituted. Bones firmly united, and, I think, in place. Splints to be removed during the day, &c. &c.

April 1. She has been at work eight weeks. Bones united without deformity. Lower end of ulna projects laterally, but not in front. Pronation and supination perfect. Flexion of wrist-joint and of finger-joints not completely restored.

CASE 33. *Simple fracture. Union with deformity and maiming.*

Hannah Davis, æt. 52, broke the radius very near its lower end. It was dressed by a surgeon in Pennsylvania.

Three years after the accident, I saw her. She was residing in Bath, Steuben County, N. Y. Her hand was bent backwards and to the radial side. The lower end of the ulna was very prominent.

The fingers were contracted, and the whole hand weak. I have not recorded, nor do I remember the treatment that was adopted.

CASE 34. *Simple fracture. Union with deformity.*

Morton Williams, of Buffalo, æt. 8, fell, in July, 1851, and broke the radius at the junction of the epiphysis with the shaft. Dr. Aldrich, a very intelligent young surgeon in a neighboring town, had charge of the arm. After the lapse of several days, the lad was brought home and placed under my care. I found the dressings neatly and judiciously applied, but on removing them I discovered the hand was inclined to the radial side, leaving the ulna projecting below. The lower fragment and the wrist were carried slightly backwards, and the lower end of the upper fragment forwards. I attempted to restore the fragments to position, but I found the union too firm. I then applied splints with compresses, firmly, and after a few days I found a slight improvement, but some deformity has remained. The motions of the wrist are perfect.

CASE 35. *Simple fracture. Union with deformity. Prosecution.*

Mrs. Raymond, of Albion, N. Y., æt. 29, was turned over in a stage-coach and broke the radius just above the wrist-joint. Dr.

Huff, a surgeon of well-known skill, residing in Albion, was called and treated the fracture.

About three months after, Mrs. Raymond called upon me to ascertain whether the arm could be improved, and whether I believed the treatment had been correct.

The hand falls slightly to the radial side, and the lower end of the ulna is prominent. The motions of the wrist-joint are not free.

She subsequently commenced an action against the doctor for damages, but I am not aware that it was ever brought to trial.

CASE 36. *Simple fracture. Union with deformity.*

Mrs. J. D. Bates, of Attica, æt. 56, broke her right radius just above the wrist, in November, 1851. Dr. Boyce, of Attica, dressed the fracture.

The arm was dressed with two straight splints with pads laid underneath, both on the palmar and dorsal surface of the wrist. Vesications occurred under the compresses. The splints were worn more than ten weeks.

Nearly four months after the accident, Mrs. B. called upon me. The hand then fell to the radial side, and the lower end of the ulna was prominent to the ulnar side. The hand was still swollen, stiff, and very weak.

March 31, 1856. The hand has not improved much. She cannot bend the wrist-joint, nor can she supine the forearm. The fingers can be partially flexed, but not sufficiently to grasp anything; indeed, the whole arm is nearly powerless. She suffers almost constantly some pain in the wrist and hand.

Simple fracture (*not treated by a regular surgeon*). *Union with deformity.* (See Case 4, Fractures of Ulna.)

Samuel Duckett, æt. 14, broke his left radius just above the wrist. It was examined by an empiric (a German doctor), who said it was not broken, and adopted no treatment.

Four weeks after the accident, he came to the hospital, with a fracture of the olecranon process of the ulna, which had occurred two days before.

The fragments of the radius are firmly united. The hand falls to the radial side; the lower end of the ulna projecting remarkably. The power of supination and pronation is lost. The hand is forcibly proned.

Fractures commencing on the Radial Side of the Bone, and terminating in the Joint.

CASE 37. *Simple fracture. Result perfect.*

William Henry Valentine, of Buffalo, æt. 13, fell, Nov. 10, 1855, from a tree, about twelve feet, striking upon the right hand and wrist.

The bone was broken very obliquely from the radial side downwards towards the ulnar side, and I think it entered the joint without entirely traversing the shaft of the bone.

The hand fell to the radial side, and the lower fragment was displaced backwards.

William was admitted to the hospital on the following day, at which time I reduced the fracture, and dressed the arm with a straight wooden splint on the palmar aspect, and a piece of binders' board on the dorsal, both well covered and padded. I applied, also, two extra pads, one over the lower fragment on the back of the wrist, and one over the upper fragment in front and near the middle of the arm.

On the 7th day, I readjusted the dressings, and found the dorsal pad had occasioned a slight vesication.

I examined the arm, April 22, 1856, five months after the accident. The bones have united without deformity or maiming.

CASE 38. *Simple fracture. Union without deformity.*

George Mallory, æt. 38, fell, February 4th, 1856, striking on the palm of his left hand. It was dressed by Dr. Lay, of Buffalo, with Day's curved splints, well padded and neatly applied; one upon the dorsal, and one upon the palmar surface. He was admitted, on the same day, to the Buffalo hospital.

Feb. 7. Dr. Lemon, the house surgeon, finding these dressings becoming painful, removed them, and applied two broad, straight, and carefully-padded splints.

This dressing was continued by myself, and by Dr. John Boardman, the hospital surgeon who succeeded me.

March 27. The splints have been for some time removed. The wrist remains swollen and stiff. The lower end of the ulna is prominent, but the fragments of the radius seem to be in exact line.

Cabinet Specimen of Separation and supposed Fracture of the Neck of the Radius. (See Pl. I. Fig. 2.)

This interesting specimen belongs to Dr. Robert Watts, of New York, by whom it has been kindly sent to me for examination. It was found in the dissecting room, and beyond this its history is not known. It is the same specimen to which Dr. Parker has referred in a note to S. Cooper's Surgery, fourth Am. ed., vol. ii. p. 334.

The bones appear to belong to an adult, the union of the epiphyses being complete, but the size would indicate that the person was rather below medium stature. The bones are dried and varnished; the interosseous ligament, and portions of the ligaments surrounding the head of the radius being the only soft parts remaining.

The radius is separated, transversely, four lines above the tubercle. The lower fragment is in no manner displaced, being neither drawn forwards, nor rotated outwards. Its broken extremity resembles somewhat a recent fracture, the bony cells, so near as I can judge in a varnished specimen, being quite open. Nor is there any appearance of callus around either fragment, unless it be in the presence of a very small deposit on the front of the lower fragment near the margin of the fracture, between which and the tubercle there exists an abrupt, irregular depression. It is most probable that the appearance of bony deposit is rather due to the removal of the bone below, which has produced a relative, but not absolute elevation above.

The upper fragment is displaced in such a manner as that its upper surface, which articulated with the humerus, is directed forwards. A crescentic piece, however, has been removed from the anterior half of the head, which allows it to rest like a cap upon the upper end of the lower fragment.

The two fragments are held together by a dried tissue, situated around and outside but not between the fragments, and which does not seem to have been disturbed except in front, where it is entirely removed.

The lesser sigmoid cavity, in which the head of the radius originally moved, is narrowed in its vertical diameter, as if its lower margin had been pressed upwards, and there is a small fossa just below, against which the head of the radius now rests.

The upper cap-like extremity, or articulating surface of the radius, is slightly irregular, as if portions of the synovial membrane had been removed by ulceration. The same appearances are presented over the whole of the greater sigmoid cavity of the ulna.

While, as I have mentioned, both bones are in their general dimensions below the medium size for adults, their upper extremities are above the medium size, at least in their transverse diameters. Thus, comparing this radius with the sound radius of an adult before me, the sound radius measures around the bicipital protuberance two inches and three lines, and the broken radius measures at the same point one inch and eleven lines; while the sound radius measures across its head, in its longest diameter, eleven lines, and the broken radius, in the same diameter, twelve lines. The same disparity exists between the upper end and the shaft of the ulna.

My conclusion is, that this was not a fracture the result of any external or sudden violence, occurring in a bone previously sound; but that it was a case of ulcerative disease of the elbow-joint, accompanied with inflammation and consequent hypertrophy of the bones, and also with caries, and resulting finally in a fracture or disruption of the bone through the neck.

Cabinet Specimen of Fracture of the Neck of the Radius. Collection of Dr. T. D. Mütter, Philadelphia.

The history of this fracture is unknown. The line of fracture seems to have passed through the neck of the left radius, just at the upper extremity of the bicipital protuberance. Union with deformity has resulted. Owing to the fracture having taken place within the insertion of the biceps, that muscle appears to have drawn forward and upward the lower end of the short upper fragment. In consequence of this movement, the articulating facet on the head of the radius is tilted backwards, so as no longer to be in contact with the humerus. As a secondary consequence, the anterior edge of the head of the radius rests permanently against the articulating surface of the humerus. At this new point of contact a new surface of articulation is seen to have been formed, while the original articulating facet is directed backwards, and lies at right angles to the one of more recent formation. At the inner edge of the new articulation of the head of the radius with the humerus, contact with the ulna has developed another surface of articulation. The upper and lower fragments are, as seen in the illustration, united at an angle, and the radius does not appear to have lost in length. (See Plate I. Fig. 3.)

Cabinet Specimens of Fractures commencing on the Radial Side of the Bone, and terminating in the Joint.

Specimen 1. Dried. Adult. Oblique fracture extending into joint. Complicated with a fracture of the styloid process of the ulna. Found in the dissecting-room, united by bone. (Pl. I. Figs. 4 and 5, palmar and dorsal surfaces of the same specimen.) (Henry H. Smith, Philadelphia.)

Specimen 2. Dried and scraped. Adult. United by bone. "It appears as if the styloid process and something more may have been broken off, not obliquely, but straight down into the joint. It is an old fracture, and strongly united. The fragment stands off and outwards from the bone, but it cannot be said that there is much displacement. There is also some appearance as if the fracture may have extended transversely or nearly so across the bone, about half an inch above the articular surface; but this appearance is only seen in front." Jackson. (H. J. Bigelow, Boston, Mass.)

Specimen 3. Dried. Adult. Broken almost perpendicularly into the joint. Not united. Fragment lost. History unknown. (Charles Gibson, Richmond, Va.)

UPPER THIRD (NECK).

No.	Age when it occurred.	Time since it occurred.	Sex.	Right or left side.	Character of the fracture.	TREATMENT.	RESULT.				
							United or not.	When united.	Amount of shortening.	Remarks.	Perfect or imperfect.
1	11 y.	1 y.	F.	R.	Simple	Forearm bent at right angles until 28th day, then straightened out.	U.			Slight anchylosis, and forced pronation of hand.	Imp.
2	8 y.	10 w.	M.	L.	Complicated with fracture of condyle	Did not employ a surgeon until after five weeks.	U.			Anchylosis; hand proned.	Imp.
3	25 y.	6 m.	M.		Complicated with dislocation of ulna		U.			Anchylosis, and loss of both pronation and supination.	Imp.
MIDDLE THIRD.											
4	21 y.	50 y.	M.		Simple		U.			Perfect in every respect, except that pronation and supination were a little restricted.	P.
5	38 y.	6 m.	M.		Simple	Palmar and dorsal splints.	U.			Slight forward bend of fragments.	Imp.
LOWER THIRD (ABOVE POINT OF COLLES' FRACTURE).											
6	16 y.	6 y.	M.		Simple		U.				P.
7	12 y.	10 y.	M.	L.	Simple		U.			Fragments bent slightly towards ulna.	P.
8	39 y.	8 y.	M.		Simple		U.				P.
9	15 y.	3 m.	M.		Simple		U.				P.
10	30 y.	4 w.	M.	R.	Simple		U.				Imp.
LOWER THIRD (NEAR UNION OF EPIPHYSIS WITH DIAPHYSIS).											
11	22 y.	3 m.	M.	L.	Simple; lower fragment displaced forwards	Straight splints.	U.			Arm straight, but wrist stiff.	P.
12	14 y.	24 y.	M.		Simple		U.				P.
13	15 y.	25 y.	M.	L.	Simple		U.				P.
14	43 y.	3 m.	F.		Simple	Straight splints.	U.				P.
15	38 y.	6 w.	F.	L.	Simple	Smith's curved splint.	U.				P.
16	40 y.	5 w.	M.	R.	Simple	Curved splint.	U.	36 d.			P.
17	35 y.	6 w.	M.	L.	Simple	Straight splint.	U.	19 d.		Some swelling and stiffness remaining; no ensheathing callus at any period.	P.
18	37 y.	18 d.	M.		Simple	Straight splint.	U.	18 d.			P.
19	60 y.		F.	R.	Simple	Curved splint one week; after this, straight splint.	U.	25 d.			P.
20	17 y.	6 m.	M.		Simple		U.				Imp.
21	25 y.	5 y.	F.	L.	Simple	Four narrow splints.	U.			Hand falls to radial side; joint stiff, &c.	Imp.
22	25 y.	1 y.	F.	R.	Simple	Straight splint, but hand pressed over to ulnar side.	U.			Hand inclines to radial side; in other respects perfect.	Imp.
23	45 y.	5 m.	M.	L.	Simple	Straight splints.	U.			Hand inclines to radial side; some stiffness of joint.	Imp.
24	38 y.	1 y.	M.	L.	Simple	Curved splint one week; after this, no splint.	U.	5 w.		Erysipelas; stiffness of wrist and fingers; bone straight.	Imp.
25	60 y.	6 w.	F.	L.	Simple	Curved splint.	U.			Hand falls to radial side and back.	Imp.

LOWER THIRD (Near Union of Epiphysis with Diaphysis)—*Continued.*

No.	Age when it occurred.	Time since it occurred.	Sex.	Right or left side.	Character of the fracture.	TREATMENT.	RESULT.				
							United or not.	When united.	Amount of shortening.	Remarks.	Perfect or imperfect.
26	56 y.	2 y.	F.	L.	Simple	Pasteboard splints.	U.			Hand falls to radial side; fingers stiff.	Imp.
27	10 y.	12 y.	M.	L.	Simple		U.		1 in.	Ulna displaced downwards.	Imp.
28	67 y	3 m.	M.	L.	Simple	Curved splint.	U.				Imp.
29	51 y.	1 y.	F.	R.	Simple		U.			Lower fragment inclines backwards; joint stiff.	Imp.
30	26 y.	4 y.	F.	L.	Simple		U.			Hand falls to radial side.	Imp.
31	48 y.	5 w.	F.	L.	Simple	Straight splints.	U.	32 d.		Hand inclines to radial side.	Imp.
32	43 y.	3 m.	F.	L.	Simple	Curved splint, and straight.	U.	26 d.		Ulna projects slightly; slight stiffness of joint.	Imp.
33	52 y.	3 y.	F.		Simple		U.			Hand bent to radial side and backwards; fingers contracted, &c.	Imp.
34	8 y.	1 y.	M.		Simple		U.			Hand inclines to radial side.	Imp.
35	29 y.		F.		Simple		U.			Hand inclines to radial side.	Imp.
36	56 y.	5 y.	F.	R.	Simple	Straight splints ten weeks.	U.			Hand falls to radial side; wrist and finger-joints stiff; arm very weak, &c.	Imp.
LOWER THIRD (Fractures commencing on the Radial Side of the Bone, and terminating in the Joint).											
37	13 y.	5 m.	M.	R.	Simple	Straight splint.	U.				P.
38	38 y.	2 m.	M.	L.	Simple	Straight splint after the third day.	U.			Fragments in perfect line, but ulna projects a little, and joints remain stiff.	P.

REMARKS.

Of thirty-eight fractures of the radius, not one was attended with such a laceration of the soft parts as to render it compound. Twenty-three occurred in males, and fifteen in females; seventeen are known to have belonged to the left arm, and eight to the right; all have united. Three occurred in the upper third, two in the middle third, and thirty-three in the lower third. All of the three occurring in the upper third are believed to have been fractures of the neck.

I am aware of the infrequency of the fracture of the neck of the radius, and of the difficulty of diagnosis. Both B. Cooper and Mr. Smith have alluded to this difficulty of diagnosis, and the case reported by Dr. T. M. Markoe to the New York Pathological Society, and published in the April number of the Amer. Med.

Monthly for 1856,[1] will serve especially to illustrate the same point; in which case the signs of a fracture of the radius at its neck were such as to deceive that experienced surgeon, yet the autopsy disclosed the fact that it was a dislocation of the head of the radius forwards, with a fracture of the ulna. Indeed, its existence as a form of fracture has been doubted by Sir Astley Cooper, and by others actually denied. I have seen no other specimens obtained from the cadaver, except the doubtful one contained in Dr. Watts' cabinet, and of which I have furnished a drawing; and the specimen owned by Dr. Mütter of Philadelphia (Pl. I. Fig. 3). Nor do I remember to have seen elsewhere a record of any other specimen. Malgaigne affirms, with his usual frankness, that although he has occasionally believed that he had met with it, the autopsy, whenever it has been obtained, has shown that it was rather a subluxation than a fracture. On the other hand, Mr. South calls it "a not unfrequent accident," but, in confirmation of this declaration, he cites no examples.

While, therefore, the presence of what appear to be the rational diagnostic signs has compelled me to record three cases as fracture of the neck of the radius, I have not so much confidence in my own skill, nor indeed in the skill or judgment of any other man, as to think that we ought to affirm positively of these accidents, lest, as has happened many times before, in the final appeal to that court whose judgment waits until after death, our decisions should be reversed.

When this fracture occurs, the upper end of the lower fragment is carried forwards by the action of that portion of the biceps which has its insertion into the tubercle; and the displacement in this direction must necessarily be increased in proportion as the arm is straightened. Such has been the character of the displacement in all of the examples I have seen, except in the case of the specimen in the possession of Dr. Watts; in which instance the upper fragment alone has suffered a change of position, a malposition so peculiar as to have been determined, no doubt, by the same cause which produced the fracture. In the Mütter specimen, the lower end of the upper fragment is drawn forwards with the upper end of the lower fragment.

Only one of the three cases reported was uncomplicated, Case 2 being complicated with a fracture of the external condyle of the humerus, and Case 3 with a dislocation of the ulna.

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[1] See also N. Y. Jour. of Med., vol. xvi. (New Series), p. 271.

In all of the cases, the upper end of the lower fragment remains displaced forwards, the hand is proned, and flexion and extension at the elbow-joint are imperfect. In the first case, the fragments were properly reduced by the surgeon, but a displacement occurred when the patient prematurely straightened the arm.

I have seen, in Dr. Mütter's cabinet, two specimens of fracture of the outer half of the head of the radius. In one case, the fragment is slightly displaced downwards in the direction of the axis of the bone, and in the other, the fragment is thrown outwards, or to the radial side. Both are united by bone.

Only two fractures have occurred in the middle third; an observation which is in striking contrast with the remark of Chelius that it is broken most frequently in its middle. In neither case has the result been entirely perfect, one case having left a slight impediment in the power of pronation and supination, and the other presenting a forward displacement of the fragments.

Of the thirty-three fractures belonging to the lower third, twenty-six were near the lower end, or within from half an inch to one inch and a little more, from the articular surface; all being included in those fractures called "Colles' fractures," and which may be either separations of the epiphyses or true fractures.

Colles described this fracture as occurring about one inch and a half above the carpal end of the bone; but Robert Smith, of Dublin, who has carefully examined all the specimens he could find, about twenty-three in number, has never seen the line of fracture removed farther than one inch from the lower end of the bone, and in several cases it is within one-quarter of an inch of this extremity. Dupuytren has also described the fracture as occurring at from three to twelve lines above the joint.

The observations of M. Vollemier also have shown that, instead of being oblique, as has generally been supposed, the fracture is almost uniformly transverse from the palmar to the dorsal surfaces of the bone, and only occasionally slightly oblique in its other diameter, or from the radial to the ulnar side. I have seen, however, at the College of Physicians, of Philadelphia, a specimen of this fracture in which the line of fracture is transverse, from side to side, but very oblique from before backwards, and from below upwards. There is also a line of incomplete fracture extending into the joint, in the direction of Barton's fracture. It is united by bone, with the usual displacement backwards.

The observations of both Smith and Vollemier have shown, moreover, that the displacement of the lower fragment is seldom sufficient to enable it to escape completely from the upper; and that when, in extremely rare instances, and in consequence of extraordinary violence, such complete separation does occur, a disruption of those ligaments which attach the lower fragment to the ulna occurs also, and the deformity becomes at once very great, so that it no longer presents the peculiar features of Colles' fracture, but resembles rather a dislocation.

In the so-called Colles' fracture, the lower and outer border of the radius, or its styloid apophysis, is swung around or tilted, as it were, upon the ulna; the lower and inner border of the same fragment being retained in place by the radio-ulnar ligaments, which do not usually suffer a complete disruption, but only a stretching or partial laceration. The upper or broken margin of the lower fragment, and also the ulnar margin, undergo very little displacement; while the lower or articular surface, and the radial margin are carried backwards, upwards, and outwards.

Surgeons have spoken of a falling in of the upper end of the lower fragment towards the ulna, as an almost inevitable result of the action of the pronator quadratus, and against which tendency they have sought carefully to provide; but there is much reason to believe that any degree of displacement in this direction is a rare event, and that, when it does exist, it is in consequence mostly of the direction of the force which has produced the fracture, rather than of the action of this muscle, only a few of the fibres of which are usually attached to the lower fragment, and in some instances, where the fracture is within a half or a quarter of an inch of the articulation, not any. Besides, there is actually in these latter cases no interosseous space into which the fragment may fall, and its displacement towards the ulna becomes, therefore, impossible.

Still, however, if one were disposed to speculate upon the condition of these parts after the fracture, it might perhaps be easy to persuade ourselves that the action of the pronator quadratus upon the upper fragment, whose broken extremity was not completely or at all disengaged from the lower, would carry both fragments together towards the ulna. But whatever might be the result of our speculations, still the fact, as proved by specimens, is not generally so: and this is not the first time that facts and theories have disagreed. The truth is that it is exceedingly unusual to find in any of the museums a specimen of this fracture having thus united. They may be found constantly tilted back in the manner I have described, occasionally tilted forwards, and, still more rarely, slightly displaced upon their broken surfaces antero-posteriorly; but it has never occurred to me, except in one, or at most in two instances, to see a specimen in which the upper end of the lower fragment was thrown towards the ulna, so as in any measure to encroach upon the interosseous space.

The almost uniform absence of this latter form of displacement may find its explanation in the direction of the force which generally produces this fracture, in the occurrence of the fracture sometimes at a point so low as to render its displacement in this direction impossible, and in the breadth of the bone at the seat of fracture, which does not permit it to fall laterally without actually increasing its length; a circumstance which its secure ligamentous attachment to the ulna at its opposite extremities, and its complete apposition to the wrist and elbow-joints, do not allow.

The mistake of those surgeons who have attempted to describe this fracture has originated in the appearance presented in nearly all recent fractures occurring at this point. The hand falls to the radial side, and seems to carry the lower end of the lower fragment with it, while the lower end of the ulna becomes unnaturally prominent in front and to the ulnar side; a condition of things which has naturally enough been ascribed to the displacement of the upper end of the lower fragment in the direction of the interosseous space. But this same radial inclination of the hand, and prominence of the ulna are present frequently when the radius is broken at its lower end and no displacement in any direction has taken place; and I have even observed it in simple sprains of the wrist, and in the hands of old or feeble persons where all the ligaments have become relaxed. It is seen, however, in a more marked degree when the bone is actually both broken and displaced backwards in its usual direction. In short, the deformity in question is due, in a large majority of instances, to the relaxation, stretching, or more or less disruption of the radio-ulnar ligaments, which permits the hand to fall to the radial side by a simple rotatory movement over its articular surface. For this reason, also, because these ligaments once lengthened or broken can never, or only after a lapse of many years, be completely restored, this deformity may be expected to continue, however exact and perfect may be the bony union.

It must be added, however, that, so long as the tilting remains, the articular surface is actually presenting somewhat to the radial side. While in the normal condition it presents downwards, forwards, and inwards, it now presents, when the displacement is considerable, downwards, backwards, and outwards.

Diday maintained that there existed usually in this fracture an overlapping or shortening of the bone in its entire diameter, and Vollemier thought that the specimens which he had examined proved that an impaction was almost universal.

Both of these opinions, it seems to me, have been successfully combated by Dr. Robert Smith: the shortening observed by Diday being found only on that side of the bone to which the lower fragment inclines, and being the result of the motion of the lower fragment already described; and the appearance of impaction being due to the ensheathing callus which is deposited usually, if the displacement is allowed to continue, in the retiring angle, opposite to the seat of fracture.

These are questions, however, requiring for their decision a very careful study of specimens, and in relation to which further observations may be necessary.

Meanwhile there is no doubt that occasional examples may be found illustrating one or more of all these varieties of displacement, and that to the impaction is sometimes added a comminution of the lower fragment, the lines of fracture extending freely into the joint. In Pl. I. Figs. 4 and 5, I have given a drawing of a specimen contained in Dr. Henry H. Smith's cabinet, at Philadelphia, the direction of the fracture being oblique from the radial side and terminating in the joint.

Dr. Robert Smith has described a fracture occurring at the same point,[1] and probably possessing the same characters as Colles' fracture; in which, the lower fragment is thrown forwards instead of backwards, and which has generally been the result of a fall upon the back of the hand. There is no such specimen, however, in any of the pathological collections in Dublin, nor has Dr. Smith ever seen a specimen obtained from the cadaver, although he reports a case which fell under his observation in practice.

I have myself reported one such case (Case 11), but I regret to say that my examination of the condition of the arm was not such as enables me to add anything to the information already possessed upon this subject; indeed, until we shall have an opportunity of studying it in the cadaver, we cannot speak very definitely of its anatomical characters.

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[1] Treatise on Fractures in the Vicinity of Joints, by Robert Wm. Smith, Dublin, 1854, pp. 162–3.

Nélaton[1] observes that all the varieties of this fracture which he has seen are often accompanied with fracture of the styloid apophysis of the ulna, and with a tearing of the triangular ligament. I am not aware that any other writer has made the same observation in relation to the frequent occurrence of a fracture of the styloid apophysis of the ulna, and I think the accident is not so common as the remark of Nélaton would lead us to suppose.

Fourteen of the examples of Colles' fracture seen by me occurred in females, and twelve in males. Five in the right arm, and fourteen in the left. The youngest was eight years old and the oldest sixty-seven.

In the first volume of the *Philadelphia Medical Examiner* (1838), will be found a description of a form of fracture occurring through the lower end of the radius, by J. Rhea Barton, of Philadelphia, which is probably much less common than Colles' fracture, and which had hitherto escaped the notice of surgeons. Its peculiarity consists in the line of fracture extending very obliquely from the articulation upwards and backwards, separating and displacing the whole or only a portion, as the case may be, of the posterior margin of the articulating surface. I have not recognized this fracture in any instance which has come under my own observation, nor have I been able to find a cabinet specimen in any pathological collection.

In relation to the prognosis in fractures occurring near the lower end of the radius, it will be observed that of twenty-eight cases, all of which were simple, not one has refused to unite, but only eleven have left no perceptible deformity or maiming after periods ranging from five weeks to twelve years. Some of these are marked as imperfect, notwithstanding the fact that the examination was made at a very early period after the union of the bones was consummated, and before the stiffness in the joints had been allowed a reasonable time to disappear; but I think it will be admitted that in this I have done no injustice to the objects of my investigations, since I have not marked any case as imperfect, unless there remained also a malposition, and generally, not unless the hand fell to the radial side; conditions which, my experience proves, are not materially changed by lapse of time.

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[1] Pathol. Chirurg., tom. i. p. 741.

In Case 27, there is an overlapping of the fragments and shortening of the forearm one inch; the radio-ulnar ligaments being completely torn asunder, and the ulna dislocated downwards to the same extent. In two cases stiffness of the wrist and finger-joints remains after one year; in one case after two years; in one case after three years, and in two cases after five years.

The deformity which has been observed most often, and indeed with only rare exceptions—being found in some degree, more or less, in several of those cases which I have marked as perfect—consists in a projection of the lower end of the ulna inwards, and generally a little forwards. In a large majority of cases, this is accompanied with a perceptible falling of the hand to the radial side, while in a few it is not. After this, in point of frequency, I have met with the backward inclination of the lower fragment. Robert Smith found this displacement almost constant in the specimens examined by him; and it is very probable that nearly all of the examples examined by myself would present more or less of the same deviation upon the naked bone; but in the living examples a slight deviation would be concealed by the numerous tendons which cover this part of the arm, and perhaps by some permanent effusions, of which I shall speak more particularly presently.

There remains for a long time, in a majority of cases, a broad, firm, uniform swelling on the palmar surface of the forearm, commencing near the upper margin of the annular ligament, and extending upwards two inches or more. This swelling continues much longer in old and feeble persons than in the young and vigorous. It is pretty generally proportioned to the amount of anchylosis existing at the wrist and finger-joints, and it disappears usually, *pari passu*, with these conditions. There can be no doubt that this phenomenon is due to an effusion, first serous, and subsequently fibrinous, along the sheaths of the tendons: and it is equally present after sprains and other severe injuries about this part, as in fractures. In many cases, however, its prolonged continuance and its firmness have led to a suspicion that the bones were displaced, a suspicion which only a moderate degree of care in the examination ought easily to dispel.

A similar effusion, but in less amount, is frequently seen also on the back of the hand, below the annular ligament. When both exist simultaneously, the appearances of deformity and of displacement are greatly increased.

Here, then, we shall find a sufficient explanation of the anchylosis in the wrist and finger-joints, which, often for a time almost complete, continues occasionally many months, or even years, if indeed it is not perpetual: an anchylosis, produced not, as has generally been affirmed, by an extension of the inflammation to these joints, but simply by the inflammatory effusions and consequent adhesions along the thecæ and serous sheaths, through which the tendons all pass in their course to the hands and fingers. The fingers are quite as often thus anchylosed as the wrist-joint itself, a circumstance which is quite inexplicable on the doctrine that the anchylosis is due to an inflammation in the joints. Indeed, I have seen the fingers rigid after many months, when, having observed the case throughout myself, I was certain that no inflammatory action had ever reached them.

Nor is it any more difficult to show, I think, that the anchylosis of the wrist-joint is not due to a malposition of its articular surfaces, as has often been asserted in the written treatises, and reaffirmed by excellent surgeons when recording their testimony under oath: for, if the anchylosis of the fingers in all these cases is known not to be the result of malposition of their joint surfaces, but only of inflammation of the tendinous sheaths, why shall we refuse to accept the same explanation for the anchylosis at the wrist?

The most superficial examination of the mechanism of this joint ought to satisfy us that any moderate, or even considerable malposition of the lower fragment, after a fracture of the radius, is not sufficient in itself to occasion anchylosis. It is true that the direction of the articular surface of the radius is changed also, and that, while it was directed downwards, forwards, and to the ulnar side, it is now, perhaps, directed downwards, backwards, and to the radial side. But of what consequence is this, so long as the carpal bones, with which alone this bone is articulated, preserve their relations to the radius unchanged?

I suspect it will be found very difficult for any one, however ingenious, to offer even a plausible argument in defence of this doctrine of anchylosis, as applied to this fracture, so long and so positively affirmed that to-day it is thought to be established.

But, if any other evidence than such as I have furnished be demanded, it may be supplied by the experience of most surgeons; in examples of anchylosis without displacement; in examples of displacement without anchylosis, but in which the anchylosis has yielded gradually to the lapse of time, while the displacement has continued. Examples also of all these results, so incompatible with the supposition named, have been given in this report.

To what I have already said as to the prognosis in these accidents, I may be permitted to add the opinion of our distinguished countryman Dr. Mott, given in a clinical lecture before his class in the University of New York.

"Fractures of the radius within two inches of the wrist, where treated by the most eminent surgeons, are of very difficult management so as to avoid all deformity; indeed, more or less deformity may occur under the treatment of the most eminent surgeons, and more or less imperfection in the motion of the wrist or radius is very apt to follow for a longer or shorter time. Even when the fracture is well cured, an anterior prominence at the wrist, or near it, will sometimes result from swelling of the soft parts, &c."

To which the reporter, himself a surgeon in the city of New York, adds:—

"As the above opinion of Professor Mott coincides with my own observations, both in Europe and in this city, as well as with many of our most distinguished surgical authorities, I venture to hope that it may assist in removing some of the groundless and ill-merited aspersions which are occasionally thrown on the members of our profession by the ignorant or designing."[1]

In fractures of the radius occurring at the neck, the forearm must be flexed upon the arm, and the hand supined. (See remarks on Fractures of the Radius and Ulna.) A single dorsal splint, properly padded, should support the forearm, while the surgeon, having laid a compress over the upper end of the lower fragment, proceeds to secure the whole with a roller. The forearm and hand being then placed in a sling, the dressing is completed.

Especial care must be taken to prevent the forearm being extended before the bony union is fairly consummated, lest the action of the biceps, now contracted and shortened, should draw the lower fragment forwards, as it must inevitably do while the union is imperfect; an accident which, there is reason to believe, occurred in

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[1] Boston Med. and Surg. Journ., vol. xxv. p. 289, Oct. 1841. See also p. 294 of same journal.

Case 1 as late as the 28th day, resulting in a permanent displacement of the bone.

If the patient is a child, or if there is any probability that these rules will not be faithfully complied with, it would be well to secure the arm in this position with a right-angled splint.

If the fracture takes place at or near the middle of the bone, the same rules of treatment, with only slight modifications, will be applicable as in fractures of both bones. Two straight long and broad splints must be applied after being very carefully padded; and especial attention should be paid to the tendency of the fragments to become displaced forwards through the action of both the biceps and the pronator radii teres: a tendency which may, in some measure, be provided against by flexion of the arm. Case 5 will illustrate this observation.

It is only in the treatment of fractures occurring near the lower end, that modern surgeons have thought it necessary to introduce an essential modification; which consists in employing a pistol-shaped, instead of a straight splint, and by means of which the hand is thrown more or less strongly to the ulnar side.

Heister[1] speaks of inclining the hand towards the ulna, while reducing a fracture of the radius, but when the reduction has been effected he recommends a straight splint.

Among the first to advocate the permanent confinement of the hand in this position, were Mr. Cline, of London,[2] and M. Dupuytren, of Paris.[3] Mr. Cline, and after him Bransby Cooper[4] and Mr. South,[5] recommend the ordinary straight splints for the forearm, but the rollers by which the splints are secured in place are not permitted to extend lower than the wrist; so that, when the forearm is suspended in a sling, in a state of semi-pronation, the hand shall fall, by its own weight, to the ulnar side.

Dupuytren,[6] and after him Chelius,[7] adopt, in addition to the palmar and dorsal splints, the "attelle cubitale," or ulnar splint, which is a gutter composed of steel, iron, tin, or some other metal, and made to fit the ulnar margin of the forearm and hand, when the hand is drawn forcibly to the ulnar side. Blandin,[1] Nélaton,[2] and Goyraud,[3] also, under certain contingencies, employ the same. An instrument similar to this, also, but constructed of wood and gutta percha, and less curved down to the ulnar side, has been invented by Welch. (See Pl. II., Fig. 6.)

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[1] De Lavrentii Heisteri, Institutiones Chirurgicæ. Pars Prima, p. 202. Amsterdam ed.

[2] Traité des Fractures, etc., par Malgaigne, tom. i. p. 614. Paris ed.

[3] Dupuytren on the Bones. London ed., p. 140.

[4] Lectures on Surgery, by Bransby Cooper, p. 232, Amer. ed.

[5] Note to Chelius's Surgery, vol. i. p. 613.

[6] Dupuytren on the Bones.

[7] Chelius's Surg., vol. i. p. 613.

Most surgeons, however, employ either a palmar or a dorsal splint, or both palmar and dorsal splints, constructed with a knee, or pistol-shaped, and they thus avoid the necessity of the ulnar splint. Thus Nélaton,[4] Robert Smith,[5] and Erichsen,[6] recommend this peculiar form only in the dorsal splint; while Bond,[7] Hays,[8] and Ellory P. Smith,[9] place the pistol-shaped splint against the palmar surface of the forearm and hand.

A few modern surgeons have not seen fit to adopt this peculiar principle of treatment, or this form of dressing, under any of its modifications. Colles[10] recommends a straight palmar and dorsal splint, and does not incline the hand. Barton[11] advises the same, and Mr. Skey,[12] of London, having declared his preference for a couple of broad, straight splints, adds: "Great care should be taken to prevent the hand falling, and this object will be attained by inclosing the entire forearm and hand in a well-applied sling."

Professor Fauger, of Copenhagen, has undertaken to treat this fracture in some sense without any splint, the forearm and hand being simply laid over a double inclined plane, so as to bring the wrist into a state of forced flexion. "The hand having been brought into a position of strong flexion, the forearm is placed, pronated, on an oblique plane, with the carpus highest, the hand being permitted to hang freely down the perpendicular end of the plane."[13] M. Velpeau, in a report of his surgical clinic at La Charité, for the year ending September, 1846, says this plan has been tried during the year, and "the result has not been very satisfactory. The experiment, however, has not been decisive upon this mode of treatment."[1]

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[1] Malgaigne, tom. i. p. 614.

[2] Elémens de Path. Chir., par A. Nélaton, Paris ed., tom. i. p. 747.

[3] Ibid., p. 746.

[4] Ibid., p. 747.

[5] Treatise on Fractures, by Robert W. Smith, Dublin ed., p. 168.

[6] Surgery, by John Erichsen, Amer. ed., p. 215.

[7] Amer. Journ. Med. Science, April, 1852. (See Pl. IV., Fig. 1.)

[8] Ibid., Jan., 1853. (See Pl. IV., Fig. 2.)

[9] Buffalo Med. Journ., vol. ix. p. 225. (See Pl. IV., Figs. 3, 4.)

[10] Lectures on Surgery, by Abraham Colles, Amer. ed., p. 325.

[11] Philadelphia Med. Exam., 1838.

[12] Operative Surgery, by Frederick C. Skey, Am. ed., p. 161.

[13] London Lancet, May 8, 1847.

Notwithstanding these exceptions, the practice seems to be pretty well established among the leading surgeons everywhere to employ in the treatment of this fracture the principle of adduction of the hand, and always to the attainment of the same purpose, namely, rotary extension, by which they hope to retain more securely the lower fragment in place.

We come now to consider how far this peculiar treatment is capable of answering the special indications of the case we are studying.

It is assumed, as I have already intimated, that by bearing the hand strongly to the ulnar side, the fragments of the radius are brought more exactly into apposition, and more easily and effectually retained; an assumption, which supposes two things to have been determined: first, that there exists an overlapping of the fragments, either through the whole extent of their broken surfaces, or especially towards the radial side, or that the upper end of the lower fragment is inclined to fall against the ulna, or that all of these several conditions coexist; and secondly, that if such displacements do exist, they can be remedied by this manœuvre.

The first of these suppositions seems to have been sufficiently considered, and fully controverted by all those gentlemen who have particularly examined the specimens contained in the various pathological collections, and to whose careful investigations I have already repeatedly adverted. My own observation confirms also their statements. With rare exceptions, none of these displacements have been found to exist, although, as has been observed, a casual inspection of the arm when recently broken would often lead to an opposite conclusion.

In regard to the second supposition, namely, that where such displacements do exist, a forced adduction will aid in the retention of the fragments, I shall have to speak more cautiously, because, so far as I know, my opinions have received as yet no public and authoritative indorsement.

In order that adduction may prove effective, there must be some point upon which to act as a fulcrum. It is of no use that we rotate the hand for the purpose of making extension unless there can be found a resistance or limit to the rotary motion. Such a limit exists, no doubt, but to determine its availability we must ascertain its character and position.

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[1] Boston Med. and Surg. Journ., vol. xxxv. p. 213.

It is not in the lower end of the ulna, for the ulna has no point of contact with the carpal bones, and when, in the natural state of these parts, the hand is inclined to the ulnar side, the lower end of the ulna rides freely downwards upon the wrist until arrested by the ligaments which unite it with the carpus, and by the capacity of the joint to move in this direction. When the lower end of the radius is broken, and the ligaments of the joint more or less torn, the ulna, although thrust downwards much further than it could ever descend in its normal state, still fails to find a support, and spreading wider and wider from the radius as it is thrust further upon the hand, no limit can be given to its progress in this direction. It was thus that, in Case 27, I found the ulna carried downwards one inch or more.

If the fragments overlap each other in their entire diameter, it is very certain then that a fulcrum could not be obtained upon any point of their broken surfaces; and if the fracture is transverse in its antero-posterior diameter, and transverse, or only slightly oblique in its lateral diameter, when once replaced, the surfaces must of necessity support themselves, and the indication in question cannot be present. If, again, the direction of the fracture is from before backwards and oblique, and reduction has been effected, no chance still remains to prevent the sliding off of the radial edge, if it is disposed to happen, by making use of the ulnar extremity of the broken surface as a fulcrum. If the radial side is inclined to fall off, what shall prevent the ulnar from doing the same? and how then can it, the ulnar side, be used as a fulcrum? It only remains to suppose an impaction of the radial margin of the broken radius without similar impaction of the ulnar margin, or a fracture extending very obliquely from the radial margin into the joint, as the sole examples in which the lower fragment can find a sufficient fulcrum upon which the rotary extension may operate. The first of these examples I have supposed without being aware of the proof of its existence, and the second is probably rare.

I have not spoken of the ligaments which bind the lower fragment to the lower end of the ulna, and the ulna to the carpal bones, viz: the radio-ulnar, and the internal lateral ligaments; which in the normal state of the parts constitute the centre upon which forced adduction expends its power, and which still continue to be the point of resistance, when the radius is broken. And this brings me to the end and purpose of my inquiry. How feeble and uncertain must be a resistance which depends solely on these broken ligaments! and how painful to the patient must be an extension, sufficient to overcome the action of nearly all the muscles of the wrist, which is borne entirely by a few lacerated and inflamed fibres! Even in health this position, when forced, cannot be endured beyond a few seconds, and it must be difficult to estimate the sufferings which the same position must occasion when the ligaments are torn and inflamed.

I am not to be told that surgeons have not intended to teach this extreme practice; that they have never recommended forced adduction, but only a moderate and easy lateral inclination, such as can be comfortably borne. If they have not, then, they should not have spoken of making extension by this means. An easy lateral inclination has no power to do good so far as extension is concerned, any more than it has power to do harm. But the fact is that while a majority of surgeons have no doubt used less force than was hurtful, some have used more than was useful, or safe! Indeed, the sharpness of the curve given to the splints figured and recommended by Dupuytren, Nélaton, and others, sufficiently indicate that their distinguished inventors intended to accomplish by these means a forced and violent adduction.

Malgaigne, speaking of other means of extension applied to the forearm, suggested by M. Godin, M. Diday, M. Huguier, and M. Velpeau, intended to operate only in a straight line, and alluding especially to the modes devised by Huguier and Velpeau, remarks: "Sans discuter autrement le valeur comparative de ces deux appareils, je crains qu'ils ne soient bien penables à supporter pour les malades; et M. Diday nous apprend que, dans les essais qu'il a tentés, la douleur déterminée par l'extension était si forte qu'il fut obligé d'y renoncer."[1] Which remarks cannot but apply with equal force to this, or to any other means of extension which may be adopted.

After all, it must not be inferred that I have concluded to reject this mode of dressing in all of its modifications: for although I am far from being persuaded of its utility as a means of extension and retention in any case, yet I am not prepared to deny to it some very considerable value in another point of view; and when judiciously employed it can certainly do no harm. It is, I repeat, for another reason altogether than the one heretofore assigned, that I would recommend its continuance: a reason which I cannot so well explain, or hope to render intelligible, except to the practical surgeon. This position throws the whole lower end of both radius and ulna outwards towards the radial margin of the splints, and by keeping the radius more completely in view, it enables the surgeon better to judge of the accuracy of the reduction, and to recognize more readily the condition and situation of the compresses, &c. This alone, I have always considered a sufficient ground for retaining the angular splint; although, as may be seen by a reference to my cases, I have treated a number of arms satisfactorily with the straight splints alone.

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[1] Op. cit., p. 616.

Finally, while surgeons have been seeking to accomplish an indication, the existence of which is at least rendered doubtful, and by means which appear to me totally inadequate, if it did exist, they have probably too often overlooked or regarded indifferently an indication which is almost uniformly present, namely, to press forwards the tilted fragment by a force applied upon the wrist from behind, and to retain it in place by suitable compresses. And I cannot help thinking that if they had regarded this as the sole indication, an indication generally so easily accomplished, they would have made fewer crooked arms, and have saved their patients much suffering, and themselves much trouble.

It only remains for us to determine the precise form of splint which ought to be preferred, and to describe its mode of application.

The narrow "attelle cubitale" of Dupuytren, is inconvenient; nor can I give the preference to the curved dorsal splint recommended by Nélaton, and employed by Robert Smith, Erichsen, and others. It is not to me a matter of entire indifference, in case only one curved splint is employed, whether this be applied to the palmar or dorsal surfaces of the forearm. Foreign surgeons, so far as I know, have applied this splint to the dorsal surface, and the straight splint to the palmar; while American surgeons have adopted almost as uniformly the opposite rule—to whose practice, in this respect, I acknowledge myself also partial. It is to the curved splint rather than to the straight, that we mainly trust; not simply, or at all, perhaps, because of its form, but because the curved splint is also the long splint. This is the splint, therefore, which ought to be the most steady and immovable in its position. Now, the very irregularities of surface upon the palmar aspect of the forearm and hand, instead of constituting an embarrassment, enable us, when the splint is suitably prepared, and adjusted, to fix it more securely. Moreover, upon it alone, after a few days, the surgeon may see fit to rely, and in that case it ought to be applied to that surface of the arm which is most tolerant of continued pressure. The palmar surface, as being more muscular, and as having been more accustomed to frictions and to pressure, must necessarily have the advantage in this respect. The palmar splint terminating also at the metacarpo-phalangeal articulations, instead of at the wrist, as the short straight splint must do when the hand is adducted, enables the hand to be flexed upon its extremity over a hand block, or pad of proper size.

Such are the not insignificant advantages which we claim for this mode over that pursued by our transatlantic brethren.

The block suggested first by Bond, of Philadelphia (Pl. IV. Fig. 1), is a valuable addition; since the flexed position is always more easy for the fingers, and in case of anchylosis this position renders the whole hand more useful.

Dr. E. P. Smith, of Buffalo, has modified and improved the splint invented by Bond, by substituting for the immovable, a movable knee, or joint, so that the angle of adduction can be increased or diminished at pleasure, and the same splint can be used upon either arm. For the body of the splint also, he has substituted for the inflexible wood, a thick, firm piece of felt, which having been warmed, may be moulded to the form and adapted to the length of any arm. This splint, as now described, is a modification of the splint invented by Dr. Smith some years ago, and of which he has furnished a description and a drawing, in the Sept. No. of the *Buffalo Med. Journ.* for 1853.

For myself, I am in the habit of preparing extemporaneously a splint from a wooden shingle which I first cut into the requisite shape and length; the length being obtained by measuring from the front of the elbow-joint, when the arm is flexed to a right angle, to the metacarpo-phalangeal articulations. It ought, indeed, to fall half an inch short of the bend of the elbow to render it certain that it shall make no uncomfortable pressure at this point; and the direction to measure with the arm flexed, is of sufficient importance to warrant a repetition. The breadth of the splint should be in all its extent just equal to the breadth of the forearm in its widest part, so that there shall be no lateral pressure upon the bones. If the splint is of unequal breadth, the rollers cannot be so neatly applied, and it is more likely to become disarranged. Thus constructed it is to be covered with a sac of cotton cloth made to fit tightly, with the seam along its back; and afterwards stuffed with cotton batting or with curled hair. These materials may be pushed in and easily adjusted, wherever they are most needed, from the open extremities of the sac. While preparing, the splint must be occasionally applied to the arm until it fits accurately every part of the forearm and hand, only that the stuffing must be rather more firm a little above the lower end of the upper fragment. The open ends of the sac are then to be neatly stitched over the ends of the splint. This splint is now to be laid directly upon the skin without any intermediate compresses or rollers. (Pl. IV. Figs. 5 and 6.)

The advantages of this form of splint are easily comprehended. They consist of facility and cheapness of construction, accuracy of adaptation, neatness, permanency and fitness to the ends proposed.

The extemporaneous splint recommended by Dr. Isaac Hays of Philadelphia (Pl. IV. Fig. 2) is very similar, but it lacks the neatness and permanency of that which I have now described.

In all cases it is better to employ, also, at least during the first fortnight, a straight dorsal splint, of the same breadth as the palmar splint, and of sufficient length to extend from the elbow to the middle of the metacarpus. This should be covered and stuffed in the same manner as the palmar splint, except that here the thickest and firmest part of the splint must be opposite the carpus and the lower end of the lower fragment. It will answer the indications also a little more completely if, at this point, the padding is thicker on the radial than on the ulnar side.

Having restored the fragments to place, in case of Colles' fracture, by pressing forcibly upon the back of the lower fragment, the force being applied near the styloid apophysis of the radius, the arm is to be flexed upon the body and placed in a position of semi-pronation; when the splints are to be applied and secured with a sufficient number of turns of the roller, taking especial care not to include the thumb, the forcible confinement of which is always painful and never useful.

I cannot too severely reprobate the practice of violent extension of the wrist in the efforts at reduction, and that, whether this extension be applied in a straight line, or with the hand adducted. It has been shown that in a great majority of cases no indication in this direction is to be accomplished, and to pull violently upon the wrist is not only useless but hurtful. It is adding to the fracture, and to the other injuries already received, the graver pathological lesion of a stretching, a sprain, of all the ligaments connected with the joint. I am persuaded that to this violence, added to the unequal and too firm pressure of the splints, are, in a great measure, to be attributed the subsequent inflammation and anchylosis, in very many cases.

The first application of the bandage ought to be only moderately tight, and as the inflammation and swelling develop in these structures with rapidity, they should be attentively watched and loosened as soon as they become painful. It must be constantly borne in mind that, to prevent and control the inflammation, in this fracture, is the most difficult and by far the most important object to accomplish, while to retain the fragments in place when once reduced, is comparatively easy and unimportant.

During the first seven or ten days, therefore, these cases demand the most assiduous attention; and we had much better dispense with the splints entirely than to retain them at the risk of increasing the inflammatory action. Indeed I have no doubt that very many cases would come to a successful termination without splints if only the hand and arm were kept perfectly still, in a suitable position, until bony union was effected.

I must also enter my protest against many or all of those carved splints which are manufactured, hawked about the country and sold by mechanics, who are not surgeons: with a fossa for each styloid process, a ridge to press between the bones, and various other curious provisions for supposed necessities, but which never find in any arm their exact counterparts, and only deceive the inexperienced surgeon into the neglect of the proper means for making a suitable adaptation. They are the fruitful sources of excoriations, ulcerations, inflammations and deformities.

CHAPTER IX.

ULNA.

Upper Third.

Olecranon Process.

CASE 1. *Simple fracture. Union by ligament. Result perfect.*

Trulis Hanson, of Norway, Europe, æt. 52, broke the olecranon process of the right arm by a fall. It was treated by a Norwegian surgeon.

May 30, 1855, one year after the accident, I found the fragment united by ligaments one-quarter of an inch in length, and the arm quite as useful as before.

CASE 2. *Simple fracture. Union by ligament. Result nearly perfect.*

John Carbouy, of Buffalo, æt. 18, works at the Eagle Furnace, fractured the olecranon process of the right arm.

It was dressed by Dr. James P. White, of Buffalo, with a straight splint, &c.

Nine years after the accident, I found the process united by a ligament half an inch in length, and he could nearly, but not perfectly, straighten the arm. In all other respects the limb was as before.

CASE 3. *Simple fracture. Union by bone. Result nearly perfect.*

Peter Chapin, æt. 14, fractured the olecranon process. Dr. Benjamin Smith, of Berkshire, Mass., dressed the arm.

Sixty-nine years after the accident, I found the process united apparently by bone. He could not, however, straighten the arm completely, or supine it freely.

CASE 4. *Simple fracture, with a fracture of the radius at its lower end.* (See case immediately following Case 36, in Fractures of Radius.) *Result perfect.*

Samuel Duchett, of Buffalo, æt. 14, while suffering from a fracture of the radius, fell upon the point of the elbow of the same arm.

Four days after this last accident, and two days after his admission into the hospital, the elbow was much swollen, but there was no crepitus, and he could nearly straighten the arm. On the sixth day we discovered, when the olecranon was seized and attempted to be moved, a distinct crepitus.

We extended the arm, and applied a gutta percha splint, which, after the fifth day, was renewed daily, and its angle at the elbow changed. Twenty-two days after the fracture occurred, the splint was removed, and the fracture was found united by bone, and the motions of the joint unimpaired.

CASE 5. *Fracture, complicated with dislocation of the head of the radius forward. Union by ligament. Result imperfect.*

Charles Angel, of Livingston Co., N. Y., æt. 15.

This case was treated by Dr. Lauderdale of Geneseo. Six months after the accident I found the radius in place, and the olecranon process united by ligament. He could not straighten the arm completely; the forearm remaining at an angle of 45° with the arm.

Below Coronoid Process (Upper Third).

CASE 6. *Simple fracture. Result perfect.*

John Cavender, of Canada, æt. 18, broke the ulna through its upper third. It was treated by Dr. Reynald, of Toronto Hospital.

I examined the arm one year after it had been broken. The arm was perfect.

CASE 7. *Simple fracture. Result nearly perfect.*

Rose Stanton, of Buffalo, æt. 46, broke the ulna through its upper third. It was dressed by a surgeon in Buffalo.

Nine weeks after I found a slight forward bend at the seat of fracture, and the lower end of the ulna unusually prominent, to the ulnar side. The wrist was quite stiff.

CASE 8. *Simple fracture. Result not perfect.*

Ellen O'Brian, of Buffalo, æt. 32, while carrying a tub in the winter, fell upon the ice and broke her left ulna at the lower end of the upper third. Dr. Bissel, of Buffalo, was called two days after.
wide splints and a roller.
a marked deformity at the seat of
the ulna projecting to the ulnar side.

CASE 9. *Compound fracture. Result perfect.*

Miss Short, of Buffalo, æt. 7, fell and broke the ulna about four inches below the elbow-joint. The fragments penetrated through the skin on palmar surface of arm.

I applied two straight splints, but the arm was so tender and swollen that I could not apply them very snugly.

On the 28th day I removed all dressings. She could supine and extend the forearm perfectly. At the seat of fracture there was a manifest projection.

One year after date I find the arm perfect.

CASE 10. *Simple partial fracture. Complicated with dislocation of radius. Result perfect.*

Elizabeth Carmody, of Buffalo, æt. 4, broke the ulna just below the root of the coronoid process. The head of the radius was also dislocated forwards. (Incorrectly reported in communication to N. Y. Med. Soc., as a fracture of the radius. See *Trans.* 1855, p. 53.)

I reduced the dislocation easily, but could not bind the fractured ulna so as to make it straight. I applied on the palmar and dorsal surfaces of the arm and forearm, angular splints made of binders' board, well padded: but in no way could I, by pressure, or by bandaging, accomplish a complete restoration of the fragments of the ulna, and at the end of a year the projection at this point was manifest. The functions of the arm were, however, perfect.

CASE 11. *Compound fracture. Complicated with dislocation of the head of the radius forwards. United, with deformity and displacement.*

John George Brindle, of Hamburg, N. Y., æt. 17, was struck by a locomotive and severely injured in various parts of his body, June 5, 1855. I saw him with Drs. Smith and Adams a few hours after the accident. The whole left arm was then greatly swollen. Crepitus was distinct, and we diagnosed a fracture of the ulna about three inches below its upper end. We suspected also a forward luxation of the radius, but in the condition in which we found the limb we did not think it best to attempt reduction. There was a wound which seemed to communicate with the fracture. The arm was laid upon a pillow and cool lotions were directed to be applied.

Two months later I found the ulna united, with fragments bent forwards and outwards towards the radius.

The head of the radius was dislocated, and lay in front of the lower end of the humerus. Forearm shortened three-quarters of an inch. He could flex his arm freely to a right angle, and a little beyond; could straighten it perfectly. Hand slightly proned and could not supine it completely. There is a remarkable fulness above the olecranon, on the back of the arm, occasioned by the shortening of the triceps. His arm is quite strong and useful.

I am confident that any attempt to restore and retain the fragments or the dislocated radius in place would have occasioned great suffering, and probably the loss of the arm.

Middle Third.

CASE 12. *Simple fracture. Union with deformity.*

Richard Coleman, of Buffalo, æt. 39, fell and broke the right ulna near its middle, Jan. 3, 1854. He called immediately on me, and I found the fragments displaced backwards. I pressed upon them forcibly, and then applied a palmar splint, broad and padded, to the forearm and hand. I took especial pains by compresses nicely adjusted to retain the fragments in place. The arm was placed in a sling.

At the end of four weeks I removed the splints. The fragments were united and without any perceptible ensheathing callus, nor could I discover that the bone was not restored to its natural form.

Sept. 7, 1854. About eight months after the fracture, Mr. Coleman died of cholera, and I was permitted to make an autopsy. (See specimen in my collection.)

I found the fragments united with a very small amount of ensheathing callus, and the bone slightly bent in the same direction in which I at first found them.

CASE 13. *Simple fracture. Result imperfect.*

Samuel Giffone, of Belgium, æt. 30, fractured the ulna through its middle third. It was treated by a surgeon in Belgium.

Ten years after, I examined the arm. There was a slight bend at the seat of fracture, and supination was imperfect, the hand inclining to pronation. The strength of the arm was not impaired.

CASE 14. *Simple fracture, with dislocation of head of radius forwards. Result perfect.*

Michael O'Brian, of Buffalo, æt. 3, broke the ulna near its middle, and dislocated the head of the radius forwards. I reduced both

and applied splints, &c.

eks, in a perfect arm.

CASE 15. *Simple fracture, with dislocation of the head of the radius. Result perfect.*

Henry Gale, of Buffalo, æt. 9, fell from his bed. Dr. Austin Flint and myself in attendance. We found the head of the radius dislocated forwards and the ulna broken near its middle. The bones were easily replaced. We applied an angular splint to the arm and forearm, and at the end of two weeks we substituted pasteboard. The head of the radius remained perfectly in place, but the ulna became slightly bent at the seat of fracture. The motions of the arm were perfect.

CASE 16. *Compound fracture, with dislocation of head of radius. Result perfect.*

Charles Clinton, of Buffalo, æt. 9, fell and broke the ulna near its middle, dislocating, at the same moment, the head of the radius forwards. The fractured ulna was pushed through the flesh and skin.

Dr. White, of Buffalo, and myself in attendance. The fragments were easily reduced. In a few weeks the ulna had united without deformity; a slight prominence remained, however, in front of the head of the radius.

More than five years later I examined the arm, and it was in all respects perfect.

CASE. (Not treated by a surgeon) *Simple fracture. Deformity.*

Margaret Leary, æt. 26, fell down stairs and broke the ulna of the left arm.

She was admitted to the hospital Nov. 21, 1853, suffering with excessive debility and a cold abscess near the shoulder-joint. She had not discovered the fracture of the arm. The ulna was broken near its middle, and the fragments displaced backwards. Crepitus and motion were still distinct. Owing to her very feeble and irritable condition, I applied no splints. She finally recovered and left the hospital without any note being made of the result.

Lower Third.

The following two cases are copied from a report of my clinic as published in the *Buff. Med. Journ.*, vol. iii. pp. 731–32.

CASE 17. *Simple fracture. Result perfect.*

"Wednesday, March 2d, 1848. Mrs. ———, aged about 25, fell upon a log and struck upon the ulna about three inches above its lower extremity. This occurred several days since, but she has not presented herself for treatment until to-day.

"The arm was dressed with a graduated compress laid along the palmar and dorsal surface of the forearm, especial care being taken to fill up the depression immediately above the ball of the thumb and little finger. Two broad splints were applied, one upon the dorsal and one upon the palmar surface, and over these was turned a roller. Dr. H——— omitted the roller usually applied from the hand to the wrist, remarking that as the object was solely to prevent œdema, it could be of no service above the wrist, and that it might often do serious harm by pressing the broken bones against each other; and this might happen too when the roller was not applied at first unduly tight, since the subsequent swelling might be such as to tighten the roller injuriously at the seat of fracture. Omitting this first roller also we avoid all danger of that serious accident, a loss of the arm from sloughing, which has so frequently happened in the practice of the best surgeons. The circulation of the arm along its radial and ulnar sides is thus left wholly uninterrupted."

Two months from the time of the accident the arm was well, and perfect.

CASE 18. *Simple fracture. Result perfect.*

Mrs. E. Smith, aged about 26. "Mrs. S. fell yesterday from a loaded wagon and broke the ulna of the right arm, at the same point as the other patient; indeed, this is the point at which this bone is most frequently fractured. The hand is also, as in the other case, forcibly proned."

"The same dressings were applied, and the arm was laid in a sling against the side of the body, in a position midway between pronation and supination."

Three months after, the recovery was complete.

CASE 19. *Simple fracture. Result perfect.*

Phineas Williams, of Madison Co., æt. 39, had his left ulna broken about two inches from the lower end, by a direct blow. It was dressed by Dr. Havens, of Hamilton, Madison Co., N. Y.

One year after I found the bone considerably displaced at the seat of fracture; in all other respects the arm was perfect.

Case 20. *Simple fracture of ulna, complicated with partial dislocation of radius. Result not perfect.*

E. H. Bartlette, of Homer, N. Y., æt. 21, was thrown from a wagon striking upon the back of the hand and wrist of the right arm, producing a partial luxation of the lower end of the radius backwards, and an oblique fracture of the ulna near the wrist. Dr. Ashabel Patterson, of Homer, saw it about two hours after, and reduced both the dislocation and fracture. The bones were easily retained in place by Gibson's splints. The dressing was continued six weeks.

Two years after the accident, whilst Mr. B. was a student of medicine under my instruction, I found the arm as strong and as useful as the other, but he could not supine it completely. The styloid process of the ulna projects so that the wrist is one-quarter of an inch wider than the other, and measures three-quarters of an inch more in its circumference.

Case 21. *Comminuted fracture complicated with dislocation of the head of the radius. Result imperfect.*

John Lewis, of Montrose, Pa., æt. 25, broke his left ulna at two or three points, and at the same time dislocated the head of the radius forwards. Drs. Park and Patrick, of Montrose, were employed. I examined the arm two years after and found it shortened one inch; the ulna much bent forward below its middle, and the radius still displaced forwards.

Case 22. *Fracture complicated with dislocation of the head of the radius forwards. Resulting in deformity.*

Oliver H. Perry, of Erie Co., æt. 26, fractured the ulna through its lower third and at the same time dislocated the head of the radius forwards. Dr. ——, of Aurora, was employed. Three months after the accident I found the radius unreduced, and the ulna bent at the seat of fracture. The motions of pronation and supination as well as of flexion and extension were nearly complete.

CORONOID PROCESS.

Cabinet Specimen.

Specimen. Dried. Adult. Broken transversely near the extremity. United by bone quite closely and not displaced. No ensheathing callus. (Charles Gibson, Richmond, Va.)

No.	Age when it occurred.	Time since it occurred.	Sex.	Right or left side.	Character of the fracture.	TREATMENT.	RESULT.				
							United or not.	How united.	Length of uniting medium.	Remarks.	Perfect or imperfect.
UPPER THIRD (OLECRANON PROCESS).											
1	52 y.	1 y.	M.	R.	Simple		U.	Lig.	½ in.		P.
2	18 y.	9 y.	M.	R.	Simple	Straight splint.	U.	Lig.	¼ in.	Could not straighten the arm quite as well as before.	P.
3	14 y.	69 y.	M.		Simple		U.	Bone		He could not straighten the arm completely, nor supine it freely.	Imp.
4	14 y.	1 m.	M.		Simple	Straight gutta percha splint.	U.	Bone		United in 22 days.	P.
5	15 y.	6 m.	M.		Complicated with dislocation of radius		U.	Lig.		Forearm remains at an angle of 45° with the arm.	Imp.
UPPER THIRD (BELOW CORONOID PROCESS).											
6	18 y.	1 y.	M.		Simple		U.				P.
7	46 y.	9 w.	F.		Simple		U.			Slight forward bend at seat of fracture; lower end of ulna projecting slightly to ulnar side.	P.
8	32 y.	3 y.	F.	L.	Simple	2 wide splints.	U.			Bend at the seat of fracture; lower end of ulna projecting to ulnar side; arm as useful as before.	P.
9	7 y.		F.		Compound	2 straight splints.	U.				P.
10	4 y.		F.		Simple, partial, complicated with dislocation	Angular splints, &c.	U.			The fragments continued to press forwards, but functions of arm perfect.	P.
11	17 y.		M.	L.	Compound, complicated with dislocation	Rest and cooling lotions.	U.		¾ in.[1]	Head of radius remains displaced forwards; fragments of ulna bent forwards and outwards towards the radius; flexion and extension imperfect, &c.; arm quite useful.	Imp.
MIDDLE THIRD.											
12	39 y.	8 m.	M.	R.	Simple	Straight splints.	U.	4 w.		Very slightly bent backwards.	P.
13	30 y.	10 y.	M.		Simple		U.			Hand inclines to pronation; slight bend at seat of fracture.	P.
14	3 y.	6 w.	M.		Complicated with dislocation of radius	Splints.	U.				P.
15	9 y.	6 w	M.		Complicated with dislocation of radius	Angular splints, &c.	U.			Ulna slightly bent at seat of fracture.	P.
16	9 y.	5 y.	M.		Complicated with dislocation of radius	Splints.	U.			The fracture was also compound.	P.

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[1] Amount of shortening.

LOWER THIRD.

No.	Age when it occurred.	Time since it occurred.	Sex.	Right or left side.	Character of the fracture.	TREATMENT.	RESULT.				
							United or not.	How united.	Amount of shortening.	Remarks.	Perfect or imperfect.
17	25 y.	2 m.	F.		Simple	2 broad splints, &c.	U.			Before dressing, the hand was prone.	P.
18	26 y.	3 m.	F.	R.	Simple	2 broad splints, &c.	U.			Before dressing, the hand was prone.	P.
19	39 y.	1 y.	M.	L.	Simple		U.			Some displacement of fragments.	P.
20	21 y.	2 y.	M.	R.	Simple	Gibson's splints.				Cannot supine hand perfectly; lower end of ulna projects to ulnar side, &c.	Imp.
21	25 y.	2 y.	M.	L.	Comminuted, complicated with dislocation of radius forwards		U.		1 in.	Radius remains dislocated; ulna much bent forwards at seat of fracture.	Imp.
22	26 y.	3 m.	M.		Complicated with dislocation of head of radius forwards		U.			Radius remains dislocated; ulna bent at seat of fracture; all the motions of the arm nearly complete.	Imp.

REMARKS.

Of twenty-two fractures of the ulna eleven belong to the upper third, five to the middle third, and six to the lower third; or, excluding the olecranon process and confining the analysis to the shaft, the upper and lower thirds have each six, and the middle third five.

Of fractures of the coronoid process I have seen no case of which I can speak at all positively.

I know also of but one specimen in the museums in this country, and this has been reported to me by Dr. Gibson of Richmond, Va., as being in his collection.

Sir Astley Cooper mentions that he has seen one specimen of this fracture upon the cadaver, broken off completely at its base and united by a ligamentous substance, which rendered it movable upon the ulna, and permitted the ulna to slide backwards upon the lower end of the humerus whenever the arm was extended. It was accompanied also with a fracture of the external condyle of the humerus.[1] Samuel Cooper, also, in his "First Lines," describes a specimen in University College Museum, in which both olecranon and coronoid are broken off separately, and the radius is dislocated forward.

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[1] Treatise on Disloc. and Frac. of Joints, by Sir A. Cooper. Philada. ed., 1825. See also plate 17, fig. 2, of same vol.

I have mentioned all of the well-authenticated cases of which I have any knowledge, but reports of supposed cases are by no means infrequent.

In addition to the cabinet specimen seen by Sir Astley Cooper, and which I have mentioned, he believes that he has seen one case upon the living subject. Mr. Liston also reports the case of a boy, who, suspending himself by his arms from a high wall, broke at length the coronoid apophysis through the action of the brachialis internus! Dr. Fahnestock reports a case in the *Amer. Journ. of Med. Sci.*, vol. vi. p. 267. Dr. Cooper, of the Glasgow Infirmary, reports one case in the *Lond. Med. Chir. Rev.* for Aug., 1829. In the *Amer. Med. Monthly* for October, 1855, is an account of a trial for malpractice, in which a lad nine years old received some injury about the elbow-joint, which resulted in a maiming. Dr. E. R. Peaslee, Prof. of Anat. in Dartmouth Col., thought it "altogether probable that the coronoid process had been broken." Dr. Crosby, Prof. of Surg. in the same college, could not decide positively. "He had never found a fracture of the coronoid process; still, it might exist here." Dr. Spalding, of Haverhill, was of the opinion that it was broken, and that there had been a dislocation of the elbow backwards. The defendant, Dr. Moore, claimed that there had been such a dislocation, and that either the trochlea of the humerus, or the coronoid process of the ulna, had been broken. The jury did not agree, and were dismissed, and before the next term of court a nonsuit was allowed by the court.

The defendant, in his report of the trial, justly complains that Mr. Fergusson, in his *Operative Surgery*, says (or is made to say) of backward dislocation of both bones of the forearm: "In such a case, the coronoid process will *probably* be broken." This was urged in the trial by plaintiff's counsel as contradicting the medical testimony, and charging a conspiracy on the part of the doctors to defeat the ends of justice, in saying that the accident was very *rare*.

Dr. Dorsey, in his *Surgery*, says that Dr. Physick once saw a case of fracture of the coronoid process; that the forearm was kept fixed at a right angle with the humerus, and the tendency of the brachialis muscle to draw up the superior fragment was counteracted in some measure by pressure of the roller above the elbow, and "that a *perfect cure* was *readily obtained*."

In the first work referred to, Mr. Fergusson's *Surgery*, perhaps the word "possibly" has given place to "probably."

In the latter, it may well be doubted whether the case is fairly represented by Dr. Dorsey, it not having come within his own observation.

In my report on dislocations, made to the New York State Med. Soc. in 1854, I have also reported the following case:—

CASE 17. *With fracture of the coronoid process.*

I have no notes of this case, and I am compelled, therefore, to recall it imperfectly from memory. ———, of Buffalo, aged about 25 years. I found this man upon a canal-boat, with a dislocation of the left radius and ulna backwards and upwards. Dr. ——— had reduced it, as he believed, the day before, and soon after the accident. The bones were now displaced again, and the arm much swollen.

By extension and counter-extension in my usual mode, I reduced the dislocation after a few minutes; but I immediately discovered that on releasing the arm, the dislocation was reproduced. I repeated my efforts to reduce and to retain it in place several times on this day and on subsequent days, but to no purpose, and the patient left me after a few days with the bones unreduced.

The impossibility of retaining the bones in place when reduced, and the existence of an occasional slight crepitus in the first trials, determine me in recording it as a dislocation, with fracture of the coronoid process.

Within the past year, another similar case has presented itself, in a child nine years old. The bones were displaced backwards, and could not be made to stay in place except by force. I suspected a fracture of the coronoid process, and having applied an angular splint, I left him in charge of an intelligent country surgeon, Dr. Morrow, with a request that he would permit me to see the child after recovery.

On the 14th of May inst., he called upon me, and it is now evident that the process was not broken. The radius and ulna are in place, the motions of the joint are perfect, and there is no evidence that the process was ever broken. I have no doubt it was not.

I am pretty well convinced now that none of these cases were examples of fracture of the coronoid process, and that the radius and ulna will often become displaced spontaneously, after simple dislocations, and where neither the humerus nor the coronoid process is broken. There is too much disposition, I fear, on the part of all surgeons, to ascribe to extraordinary events, phenomena which are of difficult explanation; from which imputation I do not hold myself excused.

The case reported by Liston, in which the process was said to be broken by the action of the brachialis internus, has led to a frequent repetition of the opinion that it may, and often does so occur; but *malgré* the testimony of Mr. Liston, of Mr. Miller and others, I must be permitted to doubt whether this apophysis was ever detached by muscular action, since the brachialis internus is inserted not upon the process but at its base. Dr. Henry H. Smith, of Philadelphia, also, I believe, concurs with me in this opinion.

Of the five fractures of the olecranon process, three were united by ligament, the length of which in no case exceeded half an inch, and two were united by bone. In all of the examples the motions of the arm were nearly restored after a time, and only two are marked imperfect.

Of the six fractures, through the shaft of the bone in its upper third, only one is imperfect, and of the five through the middle third all are perfect, while of the six occurring through the lower third only one-half are perfect.

Of the whole number, including the olecranon process, six are imperfect and sixteen perfect. Of the thirteen simple, uncomplicated cases only one is imperfect.

In seven cases, the fracture was accompanied with a forward dislocation of the head of the radius, in three of which it remains unreduced. Of these seven cases, two belonged to the upper third, two to the lower, and three to the middle third.

In six cases there remains some displacement at the seat of fracture, of which two are displaced towards the palmar surface, one towards the dorsal, and one outwards towards the radius. The lower end, or styloid process of the ulna, is thrown inwards, to the ulnar side, in three cases. In three cases the forearm remains slightly proned, and in two it is mentioned that this was the position of the forearm, at the time of the first dressing. In no case was the forearm supined. In no case have I detected anchylosis between the radius and ulna; nor has the power of supination ever been completely lost.

The principles of treatment in fractures of the ulna seem to be so plain, and so well established, that I do not think it necessary that I should say more than to refer you to the standard treatises upon surgery, for all the necessary information.

Malgaigne has made one observation, however, which, without having myself had an opportunity to confirm, I think it worth while to reproduce. Ordinarily the arm is to be placed in a position of semi-pronation, "but when the displacement is very considerable, and threatens to destroy the interosseous space, we must have recourse to supination, and the complete apparatus for fractures of the forearm. Supination is even sometimes necessary solely to insure contact and consolidation of the fragments." M. Fleary has published a case of this kind, treated by semi-pronation, in which the fragments remained ununited and displaced, and he could only maintain them in contact by placing the forearm in a position of supination.

The surgeon must also be cautioned against allowing the arm to fall downwards between the splints, when the radius is laid uppermost against the body, in consequence of which, sometimes the fragments are forced into the osseous space, and the arm remains permanently bent.

CHAPTER X.

RADIUS AND ULNA.

Upper Third.

CASE 1. *Simple fracture. Union perfect.*

John Winslow, of Buffalo, æt. 16, fell from a fence, Sept. 25, 1855, striking upon his hand, and breaking the radius and ulna at the junction of the middle and upper thirds.

It was dressed at the hospital, on the following day, by Dr. Smith.

October 3. Not yet united. I dressed the arm with two lateral splints.

This lad left the hospital on the 12th, seventeen days after the accident, and did not return.

I have since learned that it united without deformity or maiming.

Compound fracture. No surgical treatment. Resulting in great deformity.

Wm. Sharp, of Livingston Co., æt. 59, had a compound fracture of both bones near the upper ends. *No surgeon was employed.*

Five years after the fracture I found the forearm shortened one inch; the fingers very much contracted, and the power of supination and pronation completely lost. The arm was very feeble.

Middle Third.

CASE 2. *Simple fracture. Result perfect.*

John Bowles, of Ireland, æt. 25, broke both bones. They were dressed by an Irish surgeon.

After twenty-five years there existed no traces of the fracture.

CASE 3. *Simple fracture. Result perfect.*

George Booth, of Buffalo, æt. 11. Broken through the middle third. Dr. George Burwell in attendance. Five weeks after the fracture Dr. B. brought the child to me, the bones were united and straight. There was, however, considerable ensheathing callus at the seat of fracture.

CASE 4. *Simple fracture. Result perfect.*

T. B. Seelye, of Geneva, N. Y., æt. 11, broke the radius and ulna through the middle third.

The fracture was treated by Dr. Asher Nichols.

Eleven years after, the arm was in all respects as before the accident.

CASE 5. *Simple fracture. Result perfect.*

The late Prof. James Webster broke both bones of the right forearm near the middle, when about 10 years old. The arm was dressed and subsequently treated by the late Prof. Horner, of Philadelphia.

Prof. Webster permitted me to examine the arm while he was my colleague at Buffalo, more than 30 years after the accident. I could not discover where the fracture had occurred.

CASE 6. *Simple fracture. Result perfect.*

Margaret Casey, of Ireland, æt. 9, broke radius and ulna near the middle. It was treated by Dr. Little, of Ireland.

Ten years after the accident I found the arm completely sound and with no traces of the fracture.

CASE 7. *Partial fracture. Result perfect.*

Charles Allender, of Buffalo, æt. 2, fell from a chair bending the right forearm near its middle. He was brought to me soon after. The fragments were salient backwards.

I straightened the arm by using considerable force, and the restoration was accompanied with crepitus. After two months I found the arm in all respects perfect.

CASE 8. *Simple fracture. Result perfect.*

Thompson Maxwell, æt. 16, broke the right forearm near its middle, June 11th, 1853. It was treated, at first, by Dr. Gould, of Lockport. On the seventh day he came under the charge of Dr. George Burwell. Dr. B. found the whole arm inclined to the ulnar side from the point of fracture downwards. He straightened the arm and again applied splints, but at each subsequent dressing he found the fragments displaced in the same manner, and he as often restored them to position.

Five weeks after the accident, July 18, 1853, by request of Dr. Burwell, he called upon me. The fragments were united, but with the same displacement mentioned already. There was no appearance of ensheathing callus. Pronation and supination, with flexion and extension, were perfect.

April 16, 1856, nearly three years after, I find the arm perfectly straight, so that I could not say where the fracture had occurred; all of its motions are perfect, but forced supination causes a pain near the seat of fracture. The arm is strong and larger than the opposite arm.

CASE 9. *Simple fracture. Delayed union. Result perfect.*

John L. Snedaker, of Clyde, N. Y., æt. 26, fractured both bones of the left forearm, a little below its middle. E. Darwin Colvin, of Clyde, a careful, and experienced surgeon, was in attendance.

Dr. Colvin applied a palmar and dorsal splint, well padded and of sufficient length, extending from the elbow to the ends of the fingers. These dressings were continued eight weeks. At this time the ulna had united but the radius had not.

January 14, 1845, at the request of Dr. Colvin, the patient was brought to me. It was now three months since the fracture occurred, and no union had taken place between the fragments of the radius. At my instance, Dr. Colvin rubbed the ends of the bone violently together, and then applied a graduated compress upon both the palmar and dorsal surfaces of the arm, over which and completely ensheathing the radial border, a felt splint was carefully moulded, extending from the elbow to the fingers, and with an opening to receive the thumb; over this a roller was laid as snugly as the patient could bear. The arm was then placed in a sling.

Three weeks from this time the arm was examined, and the union between the fragments was found to be tolerably firm. The limb was soon completely restored. Seven years later I found it still perfect in all respects.

CASE 10. *Simple fracture. Result imperfect.*

John H. Landon, of Pennsylvania, broke both bones near their middles.

The arm was treated by Dr. Canada, of Pa.; and after forty years I find that pronation and supination are imperfect, but that in all other respects the arm is as useful as the other.

CASE 11. *Simple fracture, and delayed union.*

Patrick Meehan, æt. 30, Dec. 26, 1855, broke the radius and ulna of his right arm, a little below their middle. His arm was caught between a hand-car and a locomotive. Both fractures oblique. I dressed the arm soon after the accident, but in consequence of the severe contusion, the arm was already so much swollen that it was impossible to apply the dressings very snugly.

The next morning he came to the hospital, and the dressings were tightened by stitching them over.

January 2 (7th day). I opened the dressings. Fragments in place. Applied two broad, straight, carefully padded splints.

10*th*. Retightened dressings by stitching.

16*th*. Removed and reapplied same splints.

30*th*. No union of fragments. Removed bandages and secured splints with tapes. The splints to be open most of the time.

About the 11th of February, I applied a firm starch bandage. At this time the ulna seemed to be united but not the radius.

April 15. Have continued splints to this time. Motion between fragments of radius still evident. Discontinued all dressings and directed cold bathings, &c.

CASE 12. *Simple fracture. Delayed union. Deformity, &c.*

Henry Mangen, of Alleghany Co., N. Y., fell on the ice, Feb. 25, 1854, and broke the left radius and ulna a little below their middle. Dr. L. M. Purple, of Wellsville, N. Y., dressed the fracture within an hour.

He applied carved splints to palmar and dorsal surfaces of forearm and hand. At the end of three weeks the ridge, intended to press between the bones on the palmar surface, had produced a line of ulceration along the whole length of the forearm. Dr. P. had been very attentive, and examined the arm frequently. At this time a slight deformity in the bone was manifest.

Two weeks later the case fell into the hands of Dr. Charles, a skilful surgeon, residing in Angelica, when the deformity had increased very much. Dr. Charles attempted to readjust the fragments, and seemed to have succeeded partially. He applied splints carefully, but at the end of a week it was as crooked as ever. By request of Dr. Charles the patient subsequently called upon me, June 27, 1854, about four months after the accident.

The whole forearm below the fracture was inclined strongly to the ulnar side, the broken ends of the ulna overlapping about one inch and a quarter, and the ends of the radius much less. The radius was firmly united, but the fragments of the ulna were slightly movable.

There was no appearance of ensheathing callus.

CASE 13. *Simple fracture. Loss of the forearm by sloughing.*

John, adopted son of Mrs. McGrath, alias Mrs. White, the "Buffalo candy woman," æt. 9. This unfortunate lad was a pauper, and had been by the county apprenticed to one of the worst women of the town. How much the boy was benefited and the county saved by this piece of economy, the sequel will show.

Friday, July 2, 1847. John fell from the top of a ladder, about 30 feet, to the ground, breaking his right radius and ulna in their middle thirds. The surgeon did not see him until four or five hours had elapsed.

Dr. A. then carefully reduced the broken bones and applied two broad splints, one on the palmar and one on the dorsal surface, both of which were covered and padded. The splints were secured by a roller.

The forearm was then placed in a sling, and he was instructed to remain quiet in the house.

3d. Dr. A. visited the patient, and examined the condition of the arm and hand, and found everything in order.

4th. Dr. A. did not call, but it being our national holiday, the lad spent the day in the street. On the 5th a medical student was sent to see him, but the student did not find him in. On the 6th Dr. A. called. The arm and the hand were then swollen and gangrenous, and on the same day I was requested to see the patient.

I found him in a very dirty apartment, lying upon a miserable bed. His right arm was resting upon a pillow, and gangrenous throughout its entire length. The dusky color, indicating gangrene in its inception, extended in the form of a crescent across the middle of the chest. The thumb and fingers were black. His countenance was good, and his intellect clear; his pulse 75 and soft; tongue clean; he had slept well the night before, and felt perfectly well.

I examined the splints and found them neatly made and carefully padded. Dr. A. had assured me that he had not applied the bandage too tight, and I had no doubt that he had informed me correctly, but I proceeded, notwithstanding, to interrogate those who were present at the time. M., a medical student, thought they were rather loosely than tightly applied. The .boy and his mother said the same. The account which they gave of what, in their opinion, had produced the result, was as follows: Notwithstanding the surgeon's instructions that the boy should be kept in the house, he was out all of the 4th and most of the 5th of July, running about the streets, firing crackers, &c., with his arm, most of the time, out of the sling and hanging by his side. His mother had locked him into the house alone, but he crawled out of the window. On the morning of the 5th the mother noticed that his fingers were black, but she thought they were blackened with powder.

We ascertained also that the boy had a diarrhœa, which had continued several days.

We ordered, therefore, one-quarter of a grain of opium to be taken every four hours, and a yeast poultice to the arm.

8th. The gangrene still extending, pulse 124; feels well.

11th. Line of demarcation formed opposite shoulder-joint.

It is not necessary to follow this case so minutely to its close. A few days after, he was removed to the Almshouse, and the separation continued until the arm fell off at the shoulder-joint, and he at length completely recovered.

CASE 14. *Compound fracture. Union after about five months, with shortening, &c.*

Johanna Foley, of Buffalo, æt. 22, broke her left arm in the upper part of the middle third of the radius and ulna. Accident occurred July 5th, 1855.

One of the fragments was pushed through the skin. Violent erysipelatous and suppurative inflammation followed.

The arm was treated at first by Dr. George Burwell, of Buffalo. On the 15th of July she was admitted to the hospital and came under the care of Dr. Ellory P. Smith, one of the surgeons to the hospital. Only mild contentive measures could be employed for two months or more.

At the commencement of my service, October 1, 1855, I found the fragment, not united, and the arm shortened three-quarters of an inch. I directed all dressings to be removed, and that the arm should be bathed with cold water daily. The patient was also directed to sit up some each day.

On the first of November union had taken place. Elbow-joint was still stiff and the hand swollen.

Dec. 20. Nearly six months after the accident, she is still slowly recovering the use of her arm and hand. Fingers, wrist, and elbow, still remain quite stiff, and some swollen; yet she has been using passive motion since the first of October.

CASE 15. *Comminuted fracture. Union with shortening, &c.*

A Frenchman, aged about 35 years, fell from the Erie Canal Aqueduct, at Rochester. The fractures were oblique and comminuted. Dr. ——, of Rochester, was called.

The next day, I found the arm dressed with three short and narrow splints, without compresses, and the hand laid upon its palm. The fragments were displaced, and it was impossible to restore them to position. They were, therefore, left overriding, the forearm being placed in two broad splints, with compresses, &c. The bones united, with a shortening of half an inch, and with slight deformity.

CASE 16. *Partial fracture. No surgeon. Union with deformity.*

Maria Jordan, of Buffalo, æt. 4, fell on her hand, with the arm extended, and bent the radius and ulna near their middle. The mother immediately bent the bones back partly, and then called upon John W. Fox, a homœopathist. He applied splints, &c.

The mother brought her to me July 26, 1853. I found the bones much bent backwards at the seat of fracture, but firm. No ensheathing callus. Hand proned, and she could not supine it completely.

Lower Third.

CASE 17. *Partial fracture. Result perfect.*

Madison, of Buffalo, æt. 3, fell and partially broke both bones near their lower ends, May 2, 1849. Dr. Sprague requested me to visit the child with him. We straightened the bones easily. No splints were applied as we found no tendency to displacement. The arm was simply laid on a pillow and kept wet a day or two with cool water.

One month after, the arm was entirely well and without deformity.

CASE 18. *Partial fracture. Result perfect.*

Elizabeth McLevy, of Buffalo, æt. 18 months, fractured the radius and ulna of the right arm through their lower third, Aug. 15, 1849. The fracture was partial, being rather bent than fractured. The deformity was very marked.

I straightened the bones and applied a paste bandage, splints, &c., but soon finding that the dressing could not be kept in place, and that, indeed, they were not necessary, I discontinued them. It resulted in a perfect cure, within a month. One year later I found the arm in all respects like the other.

CASE 19. *Partial fracture. Result perfect.*

Edward Lamphier, of Buffalo, æt. 5, fell, Dec. 7, 1855, and broke the radius and ulna of the left arm.

Fracture at the upper end of the lower third, simple and transverse.

I found the lower fragments bent backwards and not overlapped. I straightened them with moderate force, and the restoration to a straight line was attended with a cracking sensation, as if some of the fibres of the bone had suddenly given way. The arm was now perfectly straight, and the fragments showed no tendency to become displaced.

I applied a padded, straight splint to the dorsal surface of the arm.

The following day Dr. Treat, of Buffalo, the family physician, took charge of the case.

It has united without deformity.

CASE 20. *Partial fracture. Result perfect.*

Catharine Winne, of Buffalo, æt. 6, fell on her right hand, Sept. 14, 1854. I found the arm very much bent backwards from a point about one and a half inches above the wrist-joint. Both bones were bent at the same point.

I was obliged to use great force to bend the lower fragments into line. It was accomplished without crepitus; and when restored the fragments showed no disposition to become again displaced. I applied, however, a single firm, well padded splint on the palmar surface of the forearm and hand, and placed the whole in a sling.

The result, after four weeks, was a perfect arm.

CASE 21. *Partial fracture of the radius and complete fracture of the ulna. Result perfect.*

Horace Parmelee, of Buffalo, æt. 8, fell through an unfinished building, May 28, 1855, and broke the left forearm about three inches above the wrist. The arm had been partly straightened by a gentleman before I arrived. I saw the lad within an hour. The fragments were salient forwards. With considerable force I bent the fragments into line, and the restoration was attended with a single audible snap and not a crepitus. The snap was felt and heard distinctly to proceed from the radius. I inferred that one bone had been completely broken off and the other only partially, and that in restoring the latter to form I had completed the separation. There was no tendency subsequently to displacement.

I applied one dorsal splint and placed the arm in a sling. The bones were firm in about twenty-one days, and the arm perfect.

CASE 22. *Simple fracture of ulna and bend of radius near their lower ends. Result perfect.*

Peter Dalton, of Buffalo, æt. 2, fell, March 1, 1852, breaking the ulna about an inch from its lower end and bending the radius at the junction of its epiphysis with the shaft.

I saw it immediately, and with moderate force succeeded in bringing the fragments into line. I applied no splints or dressings of any kind.

On the fourth day the child was examined by Dr. Pupikofer and myself. The fragments were not displaced.

I drew the arm from the sleeve and put it underneath the waist of the dress.

Four months later I found the arm perfect.

CASE 23. *Simple transverse fracture of the radius, with partial fracture of the ulna. Result perfect.*

Lad, living at Buffalo, æt. 14. Sent to my clinic, by Dr. George Burwell. His arm had been caught in some machinery three days before, but he had only to-day called upon the doctor.

The radius was broken and slightly displaced. The ulna was only bent. I easily straightened both bones, and we then applied two broad splints with compresses, &c.

It united in a short time without any deformity.

CASE 24. *Simple fracture. Result perfect.*

Wm. Powers, of Ireland, æt. 11, broke the radius and ulna of the right arm just above the wrist.

It was treated by Dr. Savage, of Waterford, Ireland.

Fourteen years after the accident I found the arm in no way deformed or maimed, except that he could not supine or prone it quite as fully as he could the other arm.

CASE 25. *Simple fracture. Result perfect.*

Peter McEvoy, of Buffalo, æt. 8, broke right forearm just above the wrist, Aug. 1, 1849.

I dressed the arm, after reducing the fracture, with a paste bandage.

One year after the accident the arm was perfect.

CASE 26. *Simple fracture. Result perfect.*

Horace Chase, æt. 12, broke both radius and ulna, through their lower thirds. Dr. Toby, of Rochester, in attendance.

After six years, I find no deformity except a slight forward inclination of the radius at the seat of fracture.

CASE 27. *Simple fracture. Perfect union.*

An Irish lad, in Rochester, æt. 7, fell from a tree and struck on his hand; the fracture occurred just above the wrist, and was in both bones nearly, or quite, transverse, being situated at the junction of the epiphysis with the diaphysis in the case of the radius, and a little above the epiphysis in the case of the ulna. It is not certain that the fracture was complete, as the fragments were never entirely displaced, but only bent forwards. The bones were easily reduced, and with two splints retained in place.

I saw the lad after about three months, and there remained no deformity.

CASE 28. *Simple transverse fracture. Result perfect.*

H. Tucker, of Fredonia, æt. 10. Fracture near the lower end. Dressed by Dr. Wallworth, of Fredonia. Mr. T. says that when the Dr. removed the splints there was so much deformity that he seriously thought of refracturing the bones, but he did not. During about four years, Mr. T. remembers that this deformity continued gradually to disappear.

Eighteen years after the fracture, when I examined the arm, it was perfect in form and function, and it would be impossible to say where the fracture had occurred.

CASE 29. *Simple fracture. Result imperfect.*

Samuel Duckett, of Buffalo, æt. 14. Admitted to the Hospital, January 28, 1849, with a fracture of the olecranon of the left arm, and also a fracture of the radius and ulna, about one inch above the joint. The fracture of the radius and ulna occurred four weeks before admission. Dr. F., a German Dr., said it was not broken.

At the time of admission the hand was inclined strongly to the radial side; it was also proned and could not easily be supined, and the lower end of the ulna projected to the ulnar side. No crepitus. The elbow was much swollen. I attempted to reduce the bones but could not. I applied, however, a broad, straight splint to the arm and forearm, laying the arm straight upon a pillow.

After several weeks the deformity at the wrist remained the same as at first.

CASE 30. *Simple fracture. Result perfect.*

George B. Parker, of Otsego, N. Y., when about 10 years old, broke his arm transversely. The bones were very much bent out of line at the time. It was dressed, and subsequently treated by Dr. Palmer, of Otsego.

Thirteen years after the accident, when Mr. P. was a student of medicine, I examined the arm. It was in all respects as perfect as the other.

CASE 31. *Simple fracture. Reduced after two weeks. Result perfect.*

Mrs. Bridget Burke, of Buffalo, æt. 30, fell on the palm of her hand in the winter. Dr. Felchmaker, a German Dr., and Dr. Davis, a botanic Dr., saw the arm within half an hour and again the next morning. Both gentlemen believed it was a sprain.

Two weeks later she came before my class. Both radius and ulna were broken nearly transversely one inch above the joint. The lower ends of the upper fragments projected in front, and the hand was drawn backwards. The hand was inclined towards its palm, and could not be easily supined. I reduced the bones easily, and, in the presence of my students, applied one straight broad splint to the palmar surface of the arm and hand.

Four weeks from this I removed the dressings for the last time, and found the arm straight.

CASE 32. *Simple fracture, complicated with fracture of humerus. Result perfect.*

Mathew Rigany, of Buffalo, æt. 23 (see Case 8, fracture of humerus).

CASE 33. *Simple fracture. Refractured after two weeks. Result perfect.*

Lawrie, son of E. L., of Buffalo, æt. 9, fractured both bones through the lower third. No surgeon was called until two weeks had elapsed. I then found the bones overlapped and quite firmly united, and also very much bent at the seat of fracture (see cast in my museum, taken at this time). With moderate force I broke up the callus and restored the bones to place. After one year no deformity remained. I am not certain, however, but that some overlapping and shortening of the limb existed.

CASE 34. *Simple fracture. Result perfect.*

Hiram Nichols, of Chautauque Co., N. Y., æt. 16, fell upon his right hand, breaking the radius and ulna somewhat obliquely about three inches above the wrist. Dr. Brown, of Chautauque Co., was employed. The arm was dressed with two wide splints, &c.

Ten years after, when I examined the arm, the point of fracture could not be traced, but the lower end of the ulna projected to the ulnar side one quarter of an inch.

CASE 35. *Compound fracture. Result perfect.*

Anna Fero, of Buffalo, æt. 12, broke both bones of the right arm in 1851. The radius was broken about two inches, and the ulna about two and a half or three inches above the wrist. The ulna protruded through the skin at the point of fracture.

It was treated by Dr. C. H. Wilcox, of Buffalo. He employed a palmar and dorsal splint and also a right angled splint.

One year after the accident I could discover a slight elevation or ridge where the ulna was broken, but could not trace the fracture in the radius.

The motions of the arm were perfect.

CASE 36. *Simple fracture. Broken a second time at the same point. Result perfect*

Peter Tippeter, of Buffalo, æt. 32, broke his right arm in 1852, at the upper end of the lower third. Both fractures were exactly transverse and at corresponding points.

It was dressed by Dr. Charles H. Wilcox, of Buffalo. It united readily, and three months after while at work, he fractured it at the same point. Motion and crepitus were distinct.

After four months I find the arm perfect, and with a slight provisional callus at the point were the ulna was broken.

CASE 37. *Compound fracture. Result imperfect.*

James Hoffman, of Buffalo, æt. 10, broke the right arm, both bones, about two inches above the wrist, June 20, 1852, the ulna protruding through the skin.

The arm was dressed by Dr. Lewis, of Black Rock, but on the sixth day, by request of Dr. Lewis, I took charge of the case.

I found the arm much swollen, and the fragments inclining to the ulnar side. The hand prone. I applied one broad gutta percha splint, padded with cotton wadding, to the back of the hand and forearm.

After several weeks the bones united with but very slight deformity.

CASE 38. *Simple fracture, complicated with partial dislocation of radius and ulna at their lower ends. Result perfect.* (Copied from report on dislocations, made to New York State Med. Soc. 1855, p. 69 of *Transactions*.)

Lewis Colligan, of Buffalo, aged 18 years. Dr. Spaulding, of Williamsville, now deceased, was employed. Fourteen years after the accident I examined the arm. No evidence remained of the character of the injury but the shortening of the radius and ulna, which shortening was, by very careful measurement, one-third of an inch. This would imply that a fracture had existed, as declared by Dr. Spaulding. The patient, also, an intelligent man, remembers distinctly the circumstance, and that crepitus was heard and felt. The partial dislocation of the bones forwards, he remembers also, as a circumstance distinct from the fracture. But, in addition to this testimony, and the testimony of his surgeon, who was a man of excellent reputation, there remained for a year a constant tendency to displacement in the same direction. Whenever he attempted to lift even the weight of half a pound with his hand supined, the lower end of the radius would spring forwards, and all power in the arm would be lost. When this happened, as it did quite often, he always reduced the bones himself by pushing on them.

At the time of my examination, the arm was in every respect perfect, except that it was shortened.

CASE. 39. *Compound comminuted fracture. Union with deformity.*

Charles Odell, a canal boat captain, æt. 36, broke both radius and ulna near the upper end of their lower third, Nov. 3, 1852. Fracture compound and comminuted.

The first dressing was made by Dr. Lewis of Black Rock. I dressed it myself on the following day with great care, using a broad, firm, and carefully moulded gutta percha splint, which I applied to the palmar surface. The wound was on the back of the arm. I dressed it again on the third day, and he then left for New York.

Sept. 22, 1853, about seven weeks after the accident occurred, Capt. Odell called on me. The fragments were then united, but from the seat of fracture downwards the arm is very much bent to the ulnar side. The arm is, however, pretty strong. Since he left me it has been dressed by Dr. Parker, in N. Y., and by Dr. Shipman in Syracuse.

CASE. 40. *Compound fracture. Result not perfect.*

Robert Gibb, of Buffalo, æt. 35. A heavy piece of iron fell upon his right arm July 25, 1853. Dr. Green and myself in attendance. The bones were broken obliquely near the upper end of the lower third. Wound on the palmar surface. Considerable hemorrhage. We applied a broad and carefully adjusted dorsal splint, and subsequently a palmar splint was also employed. Most of the dressings were made by myself, and the arm was seen every day. The utmost care was exercised both by myself and my patient to make a straight and useful arm.

The ulna united in the usual time, but the radius was not fir until about the 29th of Sept (nine weeks). At this time I examined the arm very critically, and made a note that the limb was perfectly straight, but that there was slight ensheathing callus. Gradually, however, as the swelling continued to subside, we discovered that it was not straight. At the end of two weeks more the deformity was quite manifest; the arm being inclined to the ulnar side from the seat of fracture, downwards.

Three years after I find the arm looking much straighter. Functions perfect, except that he cannot supine it completely.

CASE 41. *Compound fracture. Non union of radius. Operation.*

L. B. of Auburn, æt. 38, broke the radius and ulna of the left arm at the upper end of the lower third. Dr. Richards, of Cayuga Co., dressed the fracture. Two years after (1835) I found the ulna united, shortened, but the radius was not united. He had no power of supination or pronation.

I exposed the broken ends of the radius, and removed a piece from each fragment with a saw. I then closed the wound completely and applied a splint. In four weeks from this time the bone had united and was firm.

The patient subsequently commenced an action against Dr. R. for damages, but it never came to trial.

CASE. The following interesting case has been furnished at my request by Dr. Winne, one of the surgeons of the Buffalo Hospital of the Sisters of Charity. Dr. Winne has also kindly sent me a cast taken from the arm before the operation was made. The fracture, as shown by the cast, was at the upper end of the lower third, and it appears to have been transverse, and at corresponding points in the two bones.

I do not feel at liberty to introduce the case among my tables, since it never came directly under my own observation, and in admitting, it therefore, I should be obliged to deviate from a rule which I have established from the beginning, and which I regard as of much importance in determining the value of these tables.

BUFFALO, March 31, 1856.

DR. F. H. HAMILTON—

MY DEAR SIR: I take the earliest opportunity to comply with your kind request to submit to your inspection the cast of the fore-arm of Henry Manger, and also to furnish you with the notes of the case taken by Dr. Ellory P. Smith at the time of the operation and subsequently.

I can only add that at the time of leaving the hospital, he had acquired much control over the flexor and extensor muscles, and was rapidly improving some weeks after his dismissal.

Respectfully yours,
CHARLES WINNE.

Notes of a case of angular deformity of the left forearm.

"Henry Manger, æt. 28, was admitted into the Hospital of the Sisters of Charity June 24th, 1854, for the removal of a distortion of the left forearm, both bones of which had been transversely fractured February 25, 1854. The radius formed the acute angle. On June 29th, Dr. Winne commenced the operation by an incision upon the most prominent portion of the radius, and having carefully denuded the bone of its investing muscles, he removed a ∇ shaped portion by means of the saw and cutting forceps. This accomplished, the ulna was found in contact with the radius, and a small and similarly shaped piece of bone was removed from it; the arm was then made straight, wound dressed with sutures and adhesive plaster, and was laid in a well-padded wire splint, and the man placed in bed. ℞. Tr. opii ♏ xl.

June 30th. No fever, pulse 85, tongue clean.

July 1st. Slight swelling, pulse 95, tongue white.

Wound discharges small quantity of reddish serum, and has an erysipelatous look.

℞. Lotio nit. plumb. Elevate arm; plasters and rollers removed.

2d. Great tension of whole arm; high fever; removed stitches from wound, and applied a yeast and Peruvian bark poultice. ℞. Pil. opii gr. ij.

3d. Better; fever abating; odors less offensive.

4th. Erysipelatous appearance has declined in a measure; fever abating; has had retention of urine from effects of opium, which the house student injudiciously attempted to relieve by trying to pass a catheter, in which he failed; patient was entirely relieved by warm fomentations, and a large warm and slightly stimulating enema.

6th. Wound granulating; poultice discontinued, and a weak solution of nitr. plumb. applied."

UPPER THIRD.											
No.	Age when it occurred.	Time since it occurred.	Sex.	Right or left side.	Character of the fracture.	TREATMENT.	RESULT.				
							United or not.	When united.	Amount of shortening.	Remarks.	Perfect or imperfect.
1	16 y.		M.		Simple		U.				P.
MIDDLE THIRD.											
2	25 y.	25 y.	M.		Simple		U.				P.
3	11 y.	5 w.	M.		Simple		U.	5 w.		Ensheathing callus.	P.
4	11 y.	11 y.	M.		Simple		U.				P.
5	10 y.	30 y.	M.	R.	Simple		U.				P.
6	9 y.	10 y.	F.		Simple		U.				P.
7	2 y.	2 m.	M.	R.	Simple		U.				P.
8	16 y.	3 y.	M.	R.	Simple		U.				P.
9	26 y.	7 y.	M.	L.	Simple	2 broad splints, felt, &c.	U. & D. U.	2 & 4 m.		Ulna united in 8 weeks, and the radius in 16.	P.
10		40 y.	M.		Simple		U.				Imp.
11	30 y.	4 m.	M.	R.	Simple	2 broad splints, paste, &c.	U. & D. U.	7 w.		Ulna united in 7 weeks, but radius had not in 4 months.	Imp.
12		4 m.	M.	L.	Simple	Carved splints.	U. & D. U.		¾ in.	Lower fragment bent to ulnar side; 4 months after fracture, ulna not united.	Imp.
13	9 y.	2 m.	M.	R.	Simple	2 broad splints.	N. U.			Arm sloughed off.	Imp.
14	22 y.	6 m.	F.	L.	Compound		D. U.	4 m.		Union delayed 4 months; arm still swollen, &c.	Imp.
15	35 y.	2 m.	M.		Comminuted	2 broad splints, &c.	U.		¼ in.	Slight deformity.	Imp.
LOWER THIRD.											
16	3 y.	7 y.	M.		Partial	No splints.	U.				P.
17	18 m.	1 y.	F.	R.	Partial	Splints, &c., for 3 or 4 days.	U.				P.
18	5 y.		M.	L.	Partial	Single splint.	U.			Fragments were at first salient backwards.	P.
19	6 y.	4 w.	F.	R.	Partial	Single splint.	U.			Salient backwards; probably at epiphysis.	P.
20	8 y.	2 m.	M.	L.	Partial and complete	Single splint.	U.	21 d.		Salient forwards.	P.
21	2 y.	4 m.	M.		Partial and complete	No splints.	U.			Ulna broken 1 inch from its lower end, and radius bent at junction of epiphysis with diaphysis.	P.
22	14 y.		M.		Partial and complete	2 broad splints.	U.			Radius broken, and ulna bent.	P.
23	11 y.	14 y.	M.	R.	Simple		U.				P.
24	8 y.	1 y.	M.	R.	Simple	Paste bandage.	U.				P.
25	12 y.	6 y.	M.		Simple		U.				P.
26	7 y.	3 m.	M.		Simple	Two splints.	U.			Probably at junction of epiphysis with diaphysis, and perhaps not complete; fragments bent forwards.	P.
27	10 y.	18 y.	M.		Simple	Splints.	U.			Deformity remaining 4 years.	P.
28	14 y.	3 m.	M.		Simple	Splints after four weeks.	U.			Deformed as in fracture of radius.	Imp.
29	10 y.	13 y.	M.		Simple		U.				P.
30	30 y.	6 w.	F.		Simple	1 straight splint after 2d week.	U.				P.
31	23 y.	6 w.	M.		Complicated with fracture of humerus	Gutta percha and wooden splints.	U.				P.
32	9 y.	1 y.	M.		Simple	Refractured after two weeks and splints applied.	U.				P.
33	16 y.	10 y.	M.	R.	Simple	Two wide splints.	U.			Ulna projects.	P.
34	12 y.	1 y.	F.	R.	Compound	Three splints.	U.				P.

LOWER THIRD—*Continued.*

No.	Age when it occurred.	Time since it occurred.	Sex.	Right or left side.	Character of the fracture.	TREATMENT.	RESULT.				
							United or not.	When united.	Amount of shortening.	Remarks.	Perfect or imperfect.
35	32 y.	8 m.	M.	R.	Simple		U.			It was accidentally re-fractured at end of about 4 months.	P.
36	10 y.	3 m.	M.	R.	Compound	One gutta percha splint.	U.				Imp.
37	18 y.	14 y.	M.	L.	Complicated		U.		½ in.		Imp.
38	36 y.	7 w.	M.		Compound comminuted	Gutta percha, &c.	U.			Lower fragments inclined to ulnar side.	Imp.
39	35 y.	3 y.	M.	R.	Compound	2 broad splints.	U. & D. U.			Ulna united soon, but the radius not until the 9th week; arm inclined to ulnar side from seat of fracture downwards.	Imp.
40	38 y.	2 y.	M.	L.	Compound		U. & N. U.			Ulna united in usual time, but radius delayed two years; operation, prosecution, &c.	Imp.

REMARKS.

Of forty fractures of the radius and ulna, one occurred through the upper third, fourteen through the middle, and twenty-five through the lower.[1] In three instances the fracture was probably at the junction of the epiphysis with the diaphysis.[2] Thirty-three of these patients were males, and seven females. Fourteen are known to have occurred in the right arm, and seven in the left.

Thirty-three were simple, of which number four were partial fractures of both bones, two were partial fractures of the ulna, with, in each instance, complete fractures of the radius, and one was a partial fracture of the radius with complete fracture of the ulna.

All of the partial fractures belonged to the lower third, and occurred in children whose ages ranged from eighteen months to fourteen years. The frequent occurrence of partial fractures in the bones of the forearm has been noticed by many surgical writers, but the remarks of Nélaton, Malgaigne and others, that they occur more often in these bones than in any other, is not sustained by my experience. Thus of fifty-three fractures of the clavicle fourteen were incomplete; while of forty fractures of the radius and ulna, broken conjointly, or of one hundred fractures of these bones both jointly and separately, only seven were partial; or to speak more precisely, and regarding each fracture of both bones of the forearm as two fractures, of one hundred and twenty fractures, only eleven were incomplete.

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[1] "Occurs most commonly in the *middle!*" Chelius, vol. i. p. 612.

[2] See Robert Smith, op. cit. p. 164, on "Separation of the inferior epiphysis of the radius, with fracture of the lower extremity of the ulna."

Five fractures were compound, one comminuted, one both compound and comminuted, one complicated with a fracture of the humerus, and one with a partial luxation of the lower end of the radius. With one exception, all of these more serious accidents are arranged among the fractures of the lower third.

In thirty-six cases bony union has been accomplished in the usual time. In Case 9 the ulna united in eight weeks, and the radius in sixteen. In Case 11 the ulna had united in seven weeks, and the radius remained disunited at four months. In Case 12 the radius was firmly united, when I examined the arm, four months after the accident, but the ulna was slightly movable. In case 14 union was delayed in both bones nearly four months. In Case 39 the ulna united in the usual time, but the radius not until the ninth week. In Case 40 the ulna also united in the usual time, but the radius was ununited after two years, and union was only then effected by an operation.

Thus, in four cases the ulna united promptly, but the radius delayed, in one case the radius united and the ulna delayed, and in one case the delay occurred in both bones.

Twenty-eight have resulted in a perfect restoration, eleven in an imperfect restoration, and one in a loss of the arm.

The prognosis in these accidents seems to take the widest range, for while a larger proportion than in the case of almost any other long bones united without appreciable deformity, a considerable proportion delay to unite or do not unite at all, and some, even where the fracture is most simple, result in the complete loss of the limb by gangrene.

Of the occurrence of gangrene, and the consequent loss of the entire arm after a simple fracture, I have reported one example. A second example has occurred in the practice of Dr. Snell, a very respectable young physician of Brooklyn, N. Y., in which "a fracture of the humerus, involving the elbow-joint, occurring in a boy of slender stamina, resulted in the loss of a part of the hand by mortification, the little finger perishing from dry gangrene, and the adjacent parts afterwards sloughing by ordinary humid mortification." A prosecution ensued, in which Drs. Willard Parker and Prince declared their conviction that "these untoward consequences were due to the bandages having been applied too tightly;" while Drs. Valentine Mott, David L. Rogers, James R. Wood, Daniel Ayers, Edward H. Dixon, and others, believed "that the mortification of the fingers resulted from causes over which he had no control."[1] The jury returned a verdict against the Dr. for $3,000. It is understood, however, that a new trial will be granted, as the verdict was clearly against the weight of testimony.

Dupuytren[2] reports two cases of fracture which resulted in gangrene. In the first case the radius was broken near the wrist, in a man forty-four years old. "An apparatus was applied but fastened too tightly, and notwithstanding the great swelling and acute pain it was not removed until the fourth day." The forearm was then "red, painful, and covered with vesications," &c. Amputation was performed above the elbow about six weeks after the accident, and the patient recovered. In the second case the radius was broken near its middle by a direct blow, in a man thirty-six years old. The fracture was simple. The surgeon applied the usual apparatus, consisting of pads, splints, &c., confined by a roller, which was applied so tightly as to give rise to very great suffering. Notwithstanding this the surgeon did not loosen the dressings, and on the fourth day, when he came to Hôtel Dieu, the hand and fingers were dead. Amputation was performed on the twelfth day at the elbow-joint, but the patient died on the twenty-second day after the accident. Dupuytren also mentions a case which had been observed by M. Thiery, where an apparatus had been applied to a supposed fracture of the radius in a young girl. After suffering excruciating torment, the forearm mortified, and amputation was the only resource; on examining the limb no trace of fracture could be discovered.

Robert Smith reports also the case of a boy, æt. 18, who had a fracture of the lower extremity of the radius through the line of the epiphysis, caused by being thrown from a horse. A surgeon applied, within an hour, a narrow roller, tightly around the wrist. On the following day the limb was intensely painful, cold, and discolored. The roller was not removed nor slackened. On the fourth day he was admitted into Richmond Hospital, when the gangrene had reached the forearm. Spontaneous separation finally occurred about two inches below the elbow, and the bones being sawn asunder, the boy recovered.[3]

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[1] Amer. Med. Gazette, Jan. 1856.

[2] On the Injuries and Dis. of Bones. London ed., pp. 145–6.

[3] Op. cit., p. 170.

Dr. Smith says, similar cases have been recorded in the *Gazette Médicale*.

Malgaigne remarks, "when the displacement is considerable, or more especially when the outward violence has been excessive, we frequently see follow a very intense inflammatory swelling, and there is no fracture which complicates itself so easily with gangrene under the pressure of apparatus."[1]

Says Nélaton: "If we make choice of the apparatus of J. L. Petit, it is necessary that it should not be applied too tightly, for, as Professor Roux has long since remarked, fractures of the forearm are those which furnish the most of the examples of gangrene, in consequence of an arrest of the circulation. This is easily understood, if we consider on the one hand the superficial position of the two principal arteries of the forearm, and on the other hand the disposition of the appareil, which must almost infallibly compress the arteries to a great extent."[2]

The cases recorded are not numerous: including the two mentioned by myself, I have no certain accounts of more than six; yet this is sufficient to warrant a serious apprehension of so grave a result.

I do not think this accident is the necessary result of any peculiar form of treatment, nor that it is always due to the negligence of the surgeon. It certainly was not in the case of the lad whom I saw, and I can easily suppose that in a majority of cases, it was due rather to the carelessness of the patient than of the surgeon. In some measure, doubtless, it may be due also to the severity of the injury and to the general condition of the patient. A number of unfortunate circumstances may have concurred, and the inflammation and swelling may have been developed with a rapidity which no one could have anticipated. Yet, that it may be the result of maltreatment on the part of the surgeon, is undeniable. It is proper, however, to descriminate between the responsibility which attaches to the surgeon as the true exponent of the state of his art, and that which attaches to the art itself as taught by the masters.

The old surgeons applied first a roller to the hand and forearm, and over this their various splints. J. L. Petit thought he had made a valuable improvement upon this simple plan in laying *over* the roller a compress, supported by a splint, designed to press between the bones, and to antagonize thus the action of the roller in drawing the fragments towards each other. Duverney believed that this object would be best accomplished by placing the pad against the skin, and *under* a circular compress; while Desault declares all of these modes inefficient, and announces a method which he regards as accomplishing at once and completely all of the indications; the sole peculiarity of which method consists in placing the graduated pads against the skin, and securing them in place by a roller.[1] Boyer[2] adopts the same method without any modifications, and Mr. Hind, in his illustrations of fractures already referred to, has seen fit to recommend the same, at least in fractures of the radius.

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[1] Op. cit., p. 589.

[2] Op. cit., p. 737.

It is quite obvious that between these various methods there remains very little if anything to choose, the differences being too trifling and unessential to claim serious consideration. Each alike is inadequate to accomplish any amount of useful pressure between the fragments; each alike is calculated to bind the bones against each other, and each alike exposes to the danger of ligation and of gangrene.

Says M. Dupuytren, "The practice of rolling the arm before the splints are applied, whether internal or external to the pads and compresses, is eminently mischievous; and instead of fulfilling, directly counteracts, the indication which it is most important to keep in view, in the treatment of fractures of the forearm."[3]

And notwithstanding the same sentiment has been reiterated by Velpeau, Malgaigne, Nélaton, Samuel Cooper, Bransby Cooper, Erichsen, Amesbury, Gibson and others, yet we find to-day the great surgeon of Heidelburg, Mr. Chelius, recommending the roller to be applied under the splints, after the manner of Desault: while Mr. Liston, Mr. Syme and Mr. Fergusson, who perhaps represent the Edinburgh School, use only pasteboard splints, above the compresses, over which are immediately applied the roller; a practice which differs very little from that recommended by Desault, and is equally obnoxious to criticism.

Among the American surgeons I believe, the advice and practice of Dupuytren has received almost universal assent, only that we have always employed splints much wider than those recommended by this distinguished surgeon. I cannot therefore agree with my accomplished countryman, Dr. Reynell Coates, if in the following paragraph he means to imply that American surgeons generally adopt Desault's treatment. Such at least is not my experience. "It would be wrong," says Dr. Coates, "not to bear testimony, on every possible occasion, against the folly so universally prevalent, that induces surgeons to apply a bandage directly to the forearm before applying splints in injuries of this character. We have often asked for a rational explanation of this practice, without effect. It is directly at war with the acknowledged indications in the coaptation of the fragments, and when the object of the whole apparatus is to thrust asunder their extremities, it commences by binding them together. Few plans in surgery are more generally followed; none can be more absurd."[1]

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[1] "Treatise on Fractures and Luxations," by P. J. Desault, Amer. ed., p. 156, 1805.

[2] Lectures of Boyer on the Bones, Amer. ed., 1805, p. 86.

[3] Op. cit., p. 147.

Of the estimate placed upon the roller by M. Mayor, the reader will judge by a reference to the passage which I shall quote further on, when I shall speak of the value of the interosseous compresses.

Amesbury and Bransby Cooper use no rollers at all—not even to secure the splints in place, the splints being made fast to the forearm by straps or tapes; a practice which, I am happy to say, has found hitherto, except perhaps among the English, very few followers.

Mr. Amesbury and Mr. South also endeavor to give to their splints an appropriate shape, by having them constructed with more or less convexity. It must be noticed, however, that the practice of these two gentlemen is very dissimilar, for while Mr. South applies the convex surface of his splint to the interosseous space, Mr. Amesbury reverses this plan, and applies the concave surface directly to the skin.

As to the width of the splints, surgeons are also very generally agreed, at the present day, that they ought to be at least wider than the arm, so as to prevent the roller or the tapes from resting against the sides of the arm.

I do not intend to deny peremptorily, and without qualification, the value of the graduated compresses, which, as we have seen, are usually laid along the interosseous spaces, to press the fragments asunder. It is necessary, however, to caution the surgeon against their injudicious use. M. Nélaton has well remarked of the appareil employed by J. L. Petit, that it must inevitably compress, to a great extent, the arteries of the forearm; and the remark is applicable, in only a less degree, to all of those other plans in which the compress is employed. And I suspect that to this portion of the dressing, quite as much as to any other cause, is due those frightful accidents of which we have already spoken. The arteries are not only exposed, from their superficial position, to pressure from a compress, but, in addition to this, it will be noticed that the two principal arteries, the radial and the ulnar, are situated upon a broad, flat surface of bone, along which this pressure must operate most disadvantageously. So early as the year 1833, M. Lenoir, in his inaugural thesis, at Paris (p. 19), called attention to this danger, and from time to time surgeons have continued to advert to it, but they have seldom given to its consideration that prominence which its importance deserves.

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[1] Amer. Jour. of Med. Sci., vol. xvii. p. 147, 1835.

I have observed another fact in this connection. When this compress is extended low down on the palmar surface, within an inch or two of the wrist-joint, it soon becomes excessively painful, and sometimes even wholly insupportable, in consequence of the pressure made upon the median nerve; and I find myself always obliged to exercise great care in the adaptation of the pads at this point. For this reason alone, I believe that in case of a fracture near the base of the radius, the lower fragment, if it were thrown towards the ulna, could not be retained in its place by graduated compresses.

In short, finding that broad splints, properly covered and padded, answer very well to crowd the muscles into the interosseous space, so far as it is proper to do so, and believing that this mode is less painful and less dangerous, I seldom resort to graduated compresses, nor can I appreciate their necessity, nor, indeed, their utility. Mr. Lonsdale also concurs with me in attaching very little value to this part of the customary appareil. But listen to the surgeon of Lausanne, M. Mayor: "Que signifient les compresses graduées entre les os de l'avant-bras afin de les tenir écartés l'un de l'autre? Ils n'auront pas la tendance qu'on leur suppose, a se rapprocher sans cesse, pouru, 1°, qu'ils soient bien réduits; 2°, que pour les maintenir en position, on ne fasse par usage de liens circulaire préables, et dont l'action est un vrai contre-sens; et enfin 3°, qu'on fasse agir les moyens contentifs essentiellement sur les regions palmaire et dorsale de l'avant-bras."[1] M. Mayor proceeds to declare these convictions to be the result of his own experience, both in the treatment of single and compound fractures of the forearm, and he is almost tempted to think that they were merely invented to remedy an evil which a roller under the splint was intended to produce; since, by dispensing with the roller, the indication for the use of the compresses does not exist. He further remarks: "Quoi qu'il en soit, le temps a consecré ce moyen, et on sait assez ce que sont les habitudes, leur ténacité, et le respect, qu'elles inspirent quand elles ont la vénérable sanction du temps, j'allais presque dire de l'aveugle routine."

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[1] Bandages et appareils a pansements, ou nouveau systeme de delegation chirurgicale, par M. Mathias Mayor, chirurg. en chef de l'hospital de Lausanne, Switzerland, p. 346, Paris ed., 1838.

Surgeons have generally, of late years, after the splints have been applied, placed the forearm in a position of semi-pronation, or midway between supination and pronation, so that the radius should be uppermost; it being assumed that in this position the two bones were most nearly parallel, and least inclined to displacement. Such, indeed, was the practice of Hippocrates, Paulus Ægineta, Celsus, Albucasis, and of most of the early surgeons; but R. Smith, Lonsdale, South, and Nélaton have called in question the correctness of this mode of dressing, at least as a universal practice.

I have before mentioned, when speaking of fractures of the ulna, that M. Fleury had, in one instance, been unable to bring the fragments into apposition, except by forced supination of the forearm, and in certain fractures of the radius the same position has been spoken of by Lonsdale, as being especially demanded.

Says Mr. South: "In fractures of both bones the forearm is best laid supine,"[1] while M. Nélaton declares that in fractures of the upper third it will be indispensable to supine the arm, both during the reduction and subsequent treatment; but that in fractures of the two inferior thirds we may place the limb in a condition of semi-pronation.[2]

It seems very probable, however, that both of these gentlemen have received their suggestions from Mr. Lonsdale;[3] who has considered the question very much at length, and who has finally declared his decided preference for the supine position in the treatment of all fractures of the forearm. His arguments are very ingenious, and as applied to fractures of the radius above the insertion of the pronator radii teres, conclusive; and indeed they commend themselves very strongly to our judgment as applied to all fractures of the forearm. They are sustained also by the results of his own experience, and I see no good reasons why they should not be more thoroughly examined and tested by other surgeons. The advantages which he claims for this method are more perfect coaptation of the fragments, less liability of the fragments to encroach upon the interosseous space, and consequently less danger of anchylosis between the bones, and of non-union of the fragments, more complete restoration of the power of supination, less tendency to lateral distortion, or of a falling off to the ulnar side, and facility of application.

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[1] Chelius's Surgery, note p. 613.

[2] Op. cit., p. 734.

[3] Treatise on Fractures, by Edward F. Lonsdale, London ed., 1838, pp. 123–138.

My own cases treated by the usual method have shown that while supination is frequently impaired, and sometimes entirely lost, pronation is rarely affected; and that the danger of an inward (ulnar) inclination of the bones, a result probably of the weight of the hand acting upon the lower fragments as it lies suspended over the sling, is not inconsiderable. Hippocrates alludes to this latter accident, and there are three specimens in the Dupuytren Museum at Paris which furnish extreme illustrations of it; the angles varying from 135° to 150°.

Mr. Lonsdale ascribes the loss of the power of supination, which, as has been observed, occurs so frequently after these fractures, not so much to the formation of a bony union between the two bones, the radius and ulna, as to the malposition of the lower fragment in its relation to the upper; an opinion which he makes to appear very probable, and which obtains additional confirmation from my own experience, since I have not recognized this bony union in a single instance of the very many described as having lost in some degree the power of supination.

If this plan is adopted, viz: laying the hand and forearm upon its back, instead of upon its ulnar margin, the elbow should remain at the side, the humerus falling perpendicularly from its socket; and the forearm should rest in the sling directed forwards from the body. But finally, whatever may be the mode of dressing, let me repeat the injunction to examine the arm frequently. No surgeon can do justice to himself or to his patient who does not look at the arm at least once in twenty-four hours during the first fortnight, and in some cases the patient ought to be seen twice daily.

When the fracture is compound, it is sometimes impossible to retain the forearm in the half-proned position; since, when placed in this position, and only slightly supported, as it must almost necessarily be, it inevitably falls over upon its palmar surface.

There can be no doubt in such a case that from the first we ought to place it upon its back in the position of complete or nearly complete supination; and in a condition also of perfect rest. For this purpose a single broad splint carefully cushioned and covered with silk oil-cloth, is the most suitable. Upon this the forearm is to be laid, and only very gently bound with rollers. If the patient is able, and wishes to walk about, the board may be suspended to the neck, as recommended by M. Mayor.

CHAPTER XI.

CARPUS.

THE few cases of fracture of the carpal bones which have come under my observation were, without exception, compound and complicated, and have resulted in the complete loss of the hand, or in some less serious, but never inconsiderable mutilation or maiming.

In no case has a treatment been adopted which might be regarded as having reference to the fracture, or the purpose of which was to insure apposition and union of the fragments.

It may be proper, however, in a matter so easily comprehended, to assume what one's personal experience has not actually proven, namely, that simple fractures of these bones will unite generally without much displacement, and without any very perceptible maiming. It is indeed quite probable that some degree of anchylosis between their adjacent surfaces would occur, yet even in the normal condition they enjoy so little motion as to render it doubtful whether its complete loss would be very sensibly felt.

In cases of compound and complicated fractures of the carpal bones, which accidents are sufficiently common, the surgeon has only, I conceive, to follow carefully those general or special indications which may happen to be present, the precise character of which it would be difficult to anticipate, and for the treatment of which it would be unsafe to attempt here to provide.

CHAPTER XII.

METACARPUS.

CASE 1. *Simple fracture. Result perfect.*

Miss E., of Erie Co., N. Y., about 18 years old, fell Aug. 7, 1853, striking upon her right hand, with her fingers forcibly flexed.

I examined the hand Aug. 8, the day following the accident, and found the metacarpal bone of the ring finger of the right hand broken about three-quarters of an inch from its lower or distal end. The distal end of the lower fragment was depressed, and a slight swelling existed over the seat of fracture. A feeble crepitus could be occasionally detected.

I applied a firm pad against the palmar surface of the metacarpo-phalangeal articulation, and secured it in place with a palmar splint.

One month later, it was united, with only slight deformity.

CASE 2. *Simple fracture. Result perfect.*

Webb Spencer, of Buffalo, æt. 29, broke the metacarpal bone of the little finger of his right hand by striking with his clenched fist May 14, 1854. The fracture is about one inch from its lower end.

He called upon me two weeks after it had occurred. The fragments were not then united. The lower end of the distal fragment was depressed towards the palm of the hand.

I applied a splint with compresses, &c. In two weeks it was united and without displacement.

CASE 3. *Simple fracture. Result perfect.*

Michael Haamond, of Buffalo, about 30 years old, broke the metacarpal bone of the thumb of the left hand through its upper third, May 10th, 1852. Simple fracture. I dressed it with a carefully moulded gutta percha splint. In less than a month the finger was well and straight.

CASE 4. *Simple fracture. Union with displacement.*

Thomas Rose, of Buffalo, æt. 8, fell down stairs Sept. 11, 1855, breaking the metacarpal bone of the index finger of the right hand, half an inch from its lower end. It was probably a separation at the epiphysis. The lower fragment projected into the palm of the hand.

I saw the lad about sixteen hours after the occurrence. I could easily replace the fragments, but they would not remain in place. There was no crepitus. I examined and dressed it very carefully, but after two months I find it still displaced.

CASE 5. *Simple fracture. Union not perfect.*

William Pimlott, æt. 27, broke one of the metacarpal bones, of the right hand, at the junction of the lower epiphysis with the diaphysis, by striking another man with his clenched fist. It was dressed by an apothecary in Ireland. Fourteen years after, I found the bone displaced backwards at the seat of fracture.

CASE 6. *Compound fracture. Result perfect.*

Harvy Herse, of Buffalo, æt. 21, cut, Sept. 6, 1851, the metacarpal bone of the index finger, through its lower third. It was cut obliquely and nearly through its entire diameter, but not quite, the separation being completed by breaking.

I tied a digital artery and applied splints. The result, after one month, was a perfect finger.

CASE 7. *Simple fracture. Result imperfect.*

T. B. of Buffalo, æt. 19, broke the metacarpal bone of the ring finger of the right hand in March 1854, by striking upon a board with his clenched fist. Fracture one inch from its lower end.

I saw it one month, and again two years after it had been broken. The fragments were then firm. Indeed it seems to have been bent rather than broken. A manifest displacement still continued; the lower end of the distal fragment being depressed toward the palm of the hand. The bone also remained quite tender at the seat of fracture.

No.	Age when it occurred.	Time since it occurred.	Sex.	Right or left side.	Character of the fracture.	Which bone.	Points of fracture.	TREATMENT.	RESULT.			
									United or not.	When united.	Remarks.	Perfect or imperfect.
1	18 y.	1 m.	F.	R.	Simple	5th	Lower third	Pad and splint.	U.	4 w.		Imp.
2	29 y.	4 w.	M.	R.	Simple	5th	Lower third	Pad and splints.	U.	4 w.		P.
3	30 y.	1 m.	M.	L.	Simple	1	Upper third	Gutta percha splints, &c.	U.			P.
4	8 y.	2 m.	M.	R.	Simple	2	Lower third epiph.	Gutta percha splints, &c.	U.		Could not keep fragment in place.	Imp.
5	27 y.	14 y.	M.	R.	Simple	5th	Lower third epiph.		U.			Imp.
6	21 y.	1 m.	M.		Compound	2	Lower third	Splints, &c.	U.			P.
7	19 y.	2 y.	M.	R.	Simple	5th	Lower third		U.		Remains bent towards palm; still tender at seat of fracture.	Imp.

REMARKS.

Of seven fractures of the metacarpal bones, one occurred in the first (metacarpal bone of the thumb), two in the second, and four in the fifth. Six occurred in the lower third, and one in the upper third. All except one were simple fractures.[1] Case 5 was a separation of the lower epiphysis, and confirmed the observations made by other writers, that such accidents are with difficulty distinguished from dislocations. Case 7 was a partial fracture.

In cases 1, 2, 5, and 7, the fractures were produced by blows upon the knuckles with the clenched fist, and in each instance the fracture was through some part of the lower third of the fifth metacarpal bone of the right hand.

The greater frequency of a fracture of the fifth bone has been noticed by both Chelius and Nélaton.

Dorsey, in his *Elements of Surgery*, mentions also that he has known the metacarpal bones to be fractured in pugilistic contests.

Of the whole number, three are now perfect and four imperfect. The displacement in every instance was the same; the lower end of the lower fragment being thrown towards the palm of the hand: a direction which is due probably, in all cases where the fracture is the result of a counter stroke, to the natural curve of the bones and to the direction of the force, and not, as Mr. B. Cooper has suggested, solely to the action of the interossei.

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[1] See remarks on fractures of phalanges.

The treatment which I have myself adopted has been very simple. I have endeavored, first, by force to restore the fragments to line, and then by compresses and moulded splints, I have sought to keep them in place.

My experience teaches me, however, not to be too sanguine of success. If the fractures had occurred in either the third or fourth metacarpal bones, both of which are less accessible than the first, second, or fifth, I should have anticipated some difficulty in restoring the fragments to place, and in keeping them there, but I confess I was not prepared for the embarrassments which have hindered my success in Cases 1 and 4; in the latter of which—a separation of the lower epiphysis—I had every opportunity which could possibly be afforded, and yet I was unable to retain the fragments in any degree of proper apposition.

The precise source of the difficulty in this case as well as in Case 1, I am not prepared to explain; but I suspect it may be found in the proximity of these fractures to the joint, and in the advantageous action of the flexor muscles operating both upon the lower end of the fragment, and upon the adjacent phalanges.

CHAPTER XIII.

PHALANGES.

CASE 1. *Simple fracture. Result perfect.*

A German lad, about twelve years old, had his fingers crushed, so that I was obliged to amputate the first finger. The second finger was also broken at the distal end of the first phalanx. I believe it was a separation of the epiphysis. Crepitus and motion between the fragments were distinct, but there was no displacement.

I treated this fracture or separation without splints. Union occurred in a few days, and without deformity.

CASE 2. *Simple fracture. Result perfect.*

Michael R., of Buffalo, æt. 36 years, broke the first phalanx of his thumb, Dec. 1, 1854. Simple fracture.

I applied a gutta percha splint. The fragments united in about three weeks, and without any perceptible ensheathing callus, and without deformity.

CASE 3. *Simple fracture. Result perfect.*

Joseph Chiynier, æt. 4, admitted to Hospital Dec. 24, 1849, with a simple fracture of the first phalanx of the ring finger of the left hand. Fracture at the junction of the epiphysis with the shaft, at the proximal end of the bone.

The finger was so much swollen that we applied, at first, only simple dressings.

On the fifth or sixth day a gutta percha splint was moulded to the finger. It resulted in a perfect cure.

CASE 4. *Simple fracture of the index finger, resulting in amputation.*

Stephen Clifford, of Buffalo, æt. 25, broke the index finger of his right hand on the 1st of Aug. 1848, and was admitted to the Hospital on the 5th of September. Deep seated inflammation had followed the injury, which had been succeeded also by suppuration and sloughing of the skin, tendons, &c. I immediately amputated the finger at the metacarpo-phalangeal articulation.

CASE 5. *Compound fracture. Result imperfect.*

John Thompson, of Buffalo, æt. 7, broke the two phalanges of the thumb through their adjacent articular surfaces, Oct. 28, 1851. The fracture was compound. I dressed the thumb carefully, with a pasteboard splint.

Union of the fragments was very tardy, and notwithstanding my utmost care, it united with a slight deformity, and with anchylosis at this joint.

CASE 6. *Compound fracture. Union with slight deformity.*

Emeline Knapp, of Auburn, N. Y., æt. 6. Her hand was caught by a door thrown violently shut, breaking one of the phalanges of the little finger, and nearly severing the finger.

I closed the wound and dressed the finger with a splint, &c. The bone united rapidly, but the distal fragment turned a very little upon its axis in the splint, during the treatment, and the palmar surface was found at last presenting diagonally towards the ring finger. I dressed the finger often and was very assiduous in my attempts to make it perfect.

CASE 7. *Compound fracture. Anchylosis.*

An Irish laborer, aged about 30 years. A bar of iron fell upon the second finger of the left hand, breaking one of the phalanges and exposing the adjacent articular surface.

I dressed the wound with sutures, &c., and applied a gutta percha splint.

The bone united with slight anchylosis and without deformity.

CASES 8, 9, 10. *Compound fractures. Result perfect.*

———, of Buffalo, aged about 25 years. His hand was caught between the bumpers while coupling cars, breaking and lacerating the first, second, and third fingers.

I dressed the wounds and then supported the fingers with a single gutta percha splint.

On the twenty-first day the first finger had united, and without any perceptible ensheathing callus. On the thirtieth day the other two fingers had united also. The union was in each case unaccompanied by deformity.

CASE 11. *Compound comminuted fracture. Union with shortening.*

Robert Taylor, of Auburn, broke the second phalanx of the little finger at two points, and at the same time bruised it severely. I removed the intercepted fragment, of half an inch in length, and dressed it with a splint, &c.

It united with shortening, but with no other deformity or maiming.

CASES 12, 13, 14. *Compound comminuted fracture. Result perfect.*

Sept. 22, 1848. George W. A., of Buffalo, about 18 years old, received an injury upon his right hand from a buzz saw, laying open the joints of the first, second, and third fingers, and comminuting the bones in the two last, so that several fragments were removed immediately, and two or three came out after the fifth or sixth day.

I applied simple cold water dressings, and believing that the motions of these joints must be lost, I kept the fingers slightly bent.

The result has been a complete restoration of the functions of all the joints.

I examined the hand six months after the injury was received.

CASE 15. *Simple fracture. Result imperfect.*

An Irish laboring woman, aged about 35 years, fell down a flight of steps and broke the first phalanx of the thumb below its middle. Dr. Congar, of this city, was called, I think, on the following day, and found the fragments displaced and shortened upon each other, and by no effort which he had made could he succeed in restoring them to place. On the same day Dr. Congar requested me to see the patient with him.

The lower or distal fragment was displaced backwards, and was lying upon the dorsal surface of the proximal fragment, being overlapped apparently about one-quarter of an inch.

Together, we repeated the efforts which Dr. C. had previously made, pulling upon the thumb with a sliding noose with all the strength of our four hands, but to no purpose. The fragments could not be reduced for one moment; and we left the patient as we found her, only a little the worse for our violent and repeated extensions.

No.	Age when it occurred.	Time since it occurred.	Sex.	Right or left side.	Character.	Which finger.	Which phalanx.	Point of fracture.	TREATMENT.	RESULT.				
										United or not.	When united.	Amount of shortening.	Remarks.	Perfect or imperfect.
1	12 y.	1 m.	M.		Simple	2d	1st	Lower third epiph.	Notreatment.	U.				P.
2	36 y.	3 w.	M.		Simple	Thumb	1st		Gutta percha splint.	U.	21 d.			P.
3	40 y.	1 m.	M.	L.	Simple	3d	1st	Upper third epiph.	Gutta percha splint.	U.				P.
4	25 y.		M.	R.	Compound	1st							Amputation on the 5th day.	Imp.
5	7 y.	1 y.	M.		Compound	Thumb	1st & 2d	Lower and upper third	Pasteboard splint.	U.			Anchylosis.	Imp.
6	6 y.	2 m.	F.		Compound	4th			Splints, &c.	U.			Lower fragment turned on its axis.	Imp.
7	30 y.		M.	L.	Compound	2d				U.			Slight anchylosis.	Imp.
8	25 y.		M.		Compound	1st			Gutta percha splint.	U.	21 d.			P.
9	25 y.		M.		Compound	2d			Gutta percha splint.	U.	30 d.			P.
10	25 y.		M.		Compound	3d			Gutta percha splint.	U.	30 d.			P.
11			M.			4th	2d			U.			Shortened half an inch, a fragment having been removed.	Imp.
12	18 y.	6 m.	M.	R.	Compound	1st			Cold water dressings.	U.			Motion of joints restored.	P.
13	18 y.	6 m.	M.	R.	Compound	2d			Cold water dressings.	U.			Motion of joints restored.	P.
14	18 y.	6 m.	M.	R.	Compound	3d			Cold water dressings.	U.			Motion of joints restored.	P.
15	35 y.		F.		Simple	Thumb	1st	Lower half					Could not reduce the fragments.	Imp.

REMARKS.

Of fifteen cases of fractures of the thumb and fingers, three belonged to the former and twelve to the latter. Twelve were compound and four simple. Five occurred through the first phalanx, two through the second, and the situation of the remainder is not noted. In two instances the separation has taken place at or near the junction of the epiphysis with the diaphysis. All of the fractures, except two, occurred in males.

Of the whole number, nine are perfect and six imperfect. In Case 6, the lower fragment has turned upon its own axis, so that its palmar surface presents obliquely to the adjoining finger. Several of the perfect results were from compound accidents and from accidents complicated with lesions of the articular surfaces—the form and motions of the joints having been completely restored.

I have never seen a fracture of the fingers produced by a counter-force, but in all instances the blow has been received directly upon the part broken; which circumstance, together with the smallness of these bones, and the thinness of their soft coverings, renders them peculiarly liable to comminution and laceration. The examples reported by me, however, give no correct idea of the relative frequency of these complications, since I continue to reject from my record all cases in which, from the nature and severity of the accident, no attempt has been made to unite the fragments. If fractures of other bones resulted as often in the necessity for immediate amputation as do fractures of the fingers, then would these reports determine in some measure the relative frequency of fractures in the several parts of the body; but such is not the fact, since a very large majority of fractures of the fingers are accompanied with so much laceration and contusion as to render their immediate removal necessary, if indeed a complete removal is not already accomplished.

The same remarks apply, with some qualifications, to fractures of the carpal and metacarpal bones, and to the corresponding bones in the lower extremities.

The displacement has been, with but one exception, slight, and in the direction of the diameter of the bone. In several instances there was no perceptible displacement whatever, the existence of the fracture having been only detected by the preternatural mobility and the crepitus. In Case 15, however, a fracture of the first phalanx of the thumb, a displacement in the direction of the axis of the bone took place; and notwithstanding the most persevering efforts on the part of the attending surgeon and myself, a reduction of the fragments was not effected. This example demonstrates the remarkable power of the muscles acting upon the thumb; and since it is quite obvious that in this instance no other cause could have operated to prevent the reduction, it may possess some value in relation to the question which has been so much discussed, as to the nature and source of the resistance, in cases of dislocation of this member.

Boyer, and after him Mr. Bransby Cooper, think that when the extreme phalanx is broken, from the small size of the bone, and from its having attached to it the nail and its matrix, it is better to amputate at once, as the process of reparation is extremely slow and uncertain.

Whether in any of the cases treated by myself, or which have been particularly noticed by me, the fracture involved the last phalanx, I am not certain, but I believe that I have seen successful attempts to unite this bone when broken, and I cannot but regard the rule made by these gentlemen as much too stringent. Examples must no doubt sometimes occur in which the fracture is so simple in its character as to render its prompt restoration pretty certain; and even though the restoration prove tedious, this would scarcely be regarded as a sufficient justification for so serious a mutilation, since the loss of even an extreme phalanx is not only a deformity, but it must prove, in many occupations, a troublesome maiming.

The rule ought still to be held inviolate, which surgeons have so often repeated, in reference to injuries inflicted upon the hand and fingers, namely, that we should save always as much as possible.

It is remarkable too how much nature, assisted by art, can do towards the accomplishment of this purpose. If the bone of a finger is not only severed completely, but also all of its soft coverings, save only a tendon or a shred of integument, a reasonable chance remains for its restoration. And it is no less interesting to observe what powers of reparation are possessed by the articular surfaces of these smaller joints, so that although they be broken into, or sawn into, or comminuted, and even although small fragments be entirely removed, a complete restoration of their functions may be hoped for. I have cited some such examples. It is true, however, that such fortunate results are very rare, and that they are rather to be hoped for than to be anticipated.

In regard to treatment, it may be remarked that in recent cases, and where considerable swelling has not already supervened, the restoration of the fragments to position is, in general, easily effected; yet even here it requires often a degree of care, which one would scarcely have anticipated, to determine whether the fragments are exactly in line; and since, in the case of these delicate bones, the slightest deviation from the natural position, determines in the end an ugly deformity, it becomes exceedingly necessary, especially with females, that we should examine the fingers carefully from day to day, so that, as the swelling subsides, we may discover and correct any displacement which may happen to exist.

As a splint I have found nothing so convenient as gutta percha or felt, moulded carefully to either the dorsal or palmar aspect of the finger; and the form of which I have generally found it necessary to change slightly as often as every third or fourth day, until consolidation was nearly or quite consummated.

If the fracture is near, or extends into a joint, the finger ought to be a little flexed so as to place it in the most useful position in the event that anchylosis should occur; and as early as the end of the second week the joint surfaces should be slightly moved upon each other in order to the prevention of fibrous or bony adhesions. Nor is there much danger of preventing the union by disturbing the broken surfaces at this early day. Union occurs between these fragments very speedily, and I have never met with a case of non-union of the phalanges, nor do I remember to have seen a case reported.

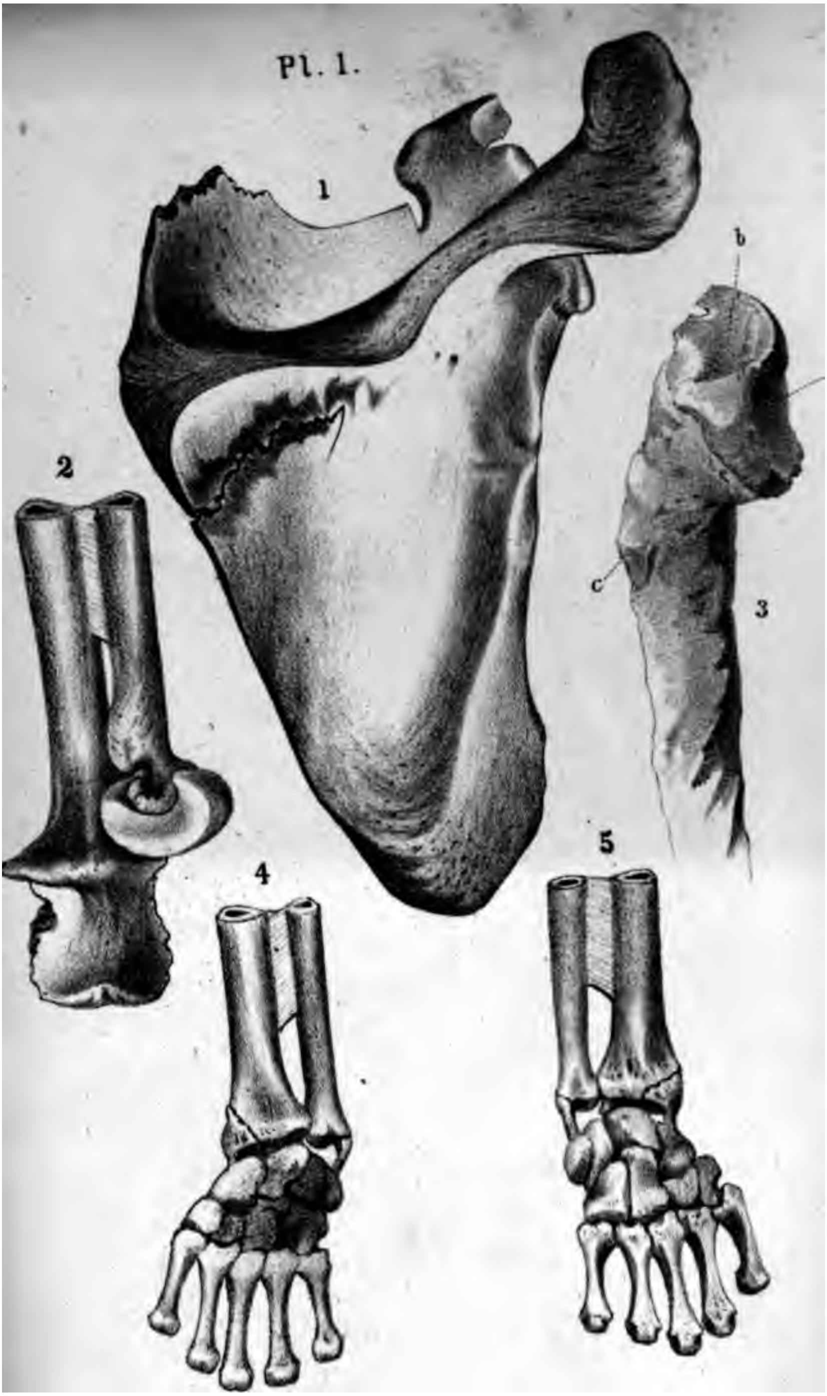
It is a lateral inclination of the lower end of the finger which it will be found most difficult to obviate, and which may, perhaps, in some cases, be most successfully combated by laying the two adjoining sound fingers against the broken finger, and then applying a moulded splint to the palmar surface of the whole. In other cases it will be more convenient to apply the splint only to the broken finger.

Rotation of the lower fragment on its own axis, such as occurred in Case 6, is especially to be guarded against, as the deformity which it occasions is more unseemly, and the impairment of utility more decided, than that occasioned by lateral displacement.

It may be well also to remind the surgeon of the convenience of extending the splint beyond the end of the last phalanx, and of moulding it to this extremity in order that the finger may be protected against injuries, and that when, from time to time the splint is removed, it may be reapplied with more accuracy.

In all cases the splint should be lined with cotton cloth or a piece of patent lint, and secured in place with narrow and neatly cut rollers made also of cotton cloth. Rollers of this width should never be torn, but cut carefully with scissors.

Pl. 1.



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APPENDIX.

CONTAINING DRAWINGS OF SPECIMENS AND OF APPARATUS REFERRED TO IN THIS REPORT.

PLATE I.

FIG. 1. *Incomplete Fracture of the Scapula.* Copied from a specimen in my possession.

FIG. 2. *Separation of the Radius at its Neck.* Drawn from a specimen in the possession of Robert Watts, N. Y.

FIG. 3. *Fracture of the Radius at its Neck.* Drawn from a specimen in the possession of T. D. Mütter, of Philadelphia.

FIG. 4. *Fracture commencing on the radial side of the Radius and terminating in the Joint. Palmar surface.* Drawn from a specimen in the possession of Henry H. Smith, Philadelphia.

FIG. 5. Do. do. do. *Dorsal surface.*

PLATE II.

FIG. 1. *Welch's Shoulder Splint,*[1] adapted to the top of the shoulder and outside of the arm. The joint is required to accommodate the upper portion of the splint to the different positions of the shoulder.

FIG. 2. *Welch's Elbow Splints.* These are fitted to the two sides of the arm, and may be fixed at any degree of flexion or extension required by turning the screw, which serves also as a pivot for the hinges *a a.* The hinges may be transferred to splints of different sizes, as required.

FIG. 3. *Welch's Forearm Splint* (dorsal).

FIG. 4. *Welch's Forearm Splint* (palmar).

FIG. 5. *Welch's Straight Splint.*

FIG. 6. *Welch's Ulnar Splint,* fitted to the ulnar side of the forearm.

"These splints consist of light and elastic cases or coverings, formed of very thin strata or layers of wood or 'cut veneers,' cemented together by interlayers of gutta percha, of such thickness as is required to maintain their form, and pressed into the form of the part for which they are designed. By this method of constructing splints, the fibres of the wood all run longitudinally or parallel with the surface, which gives them great superiority to splints carved from solid blocks of wood, however skilfully performed and fitted to the part; for when so thin as to be elastic, they are necessarily liable to split and break, and do not retain their form when wet."

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[1] Invented and manufactured by Benjamin Welch, of Lakeville (Salisbury), Conn.

Pl. II.

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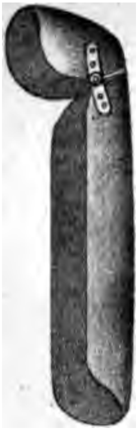

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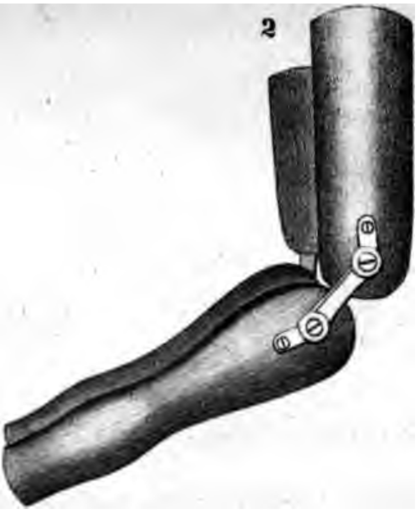

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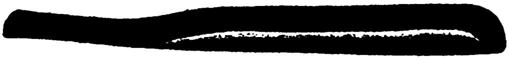

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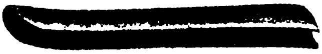

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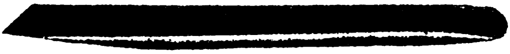

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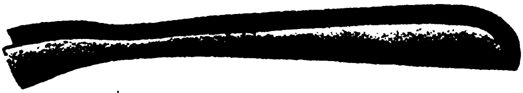

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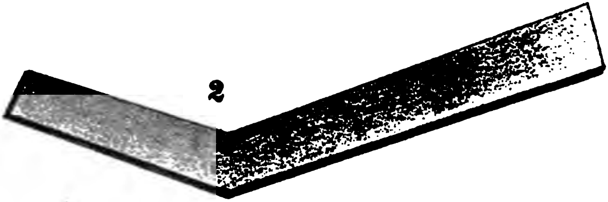
Pl. III.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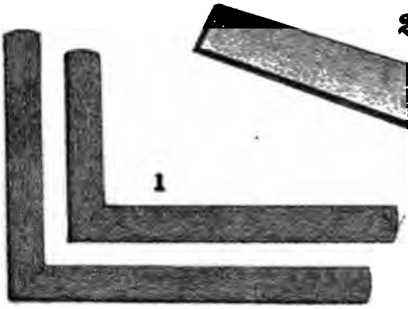
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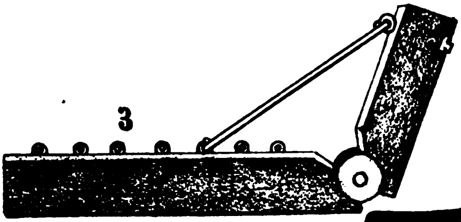
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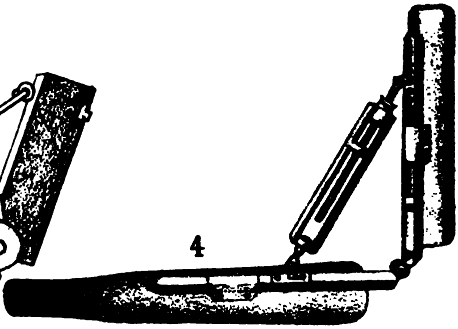
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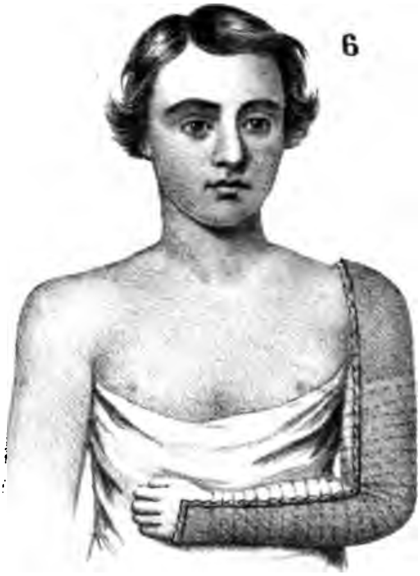
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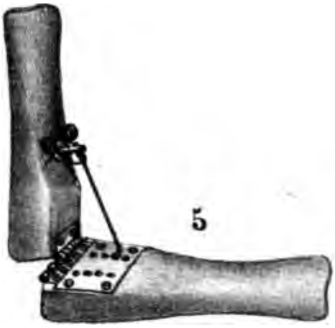
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PLATE III.

FIG. 1. *Elbow Splints, recommended by Physick.*

FIG. 2. *Physick's Splint,* designed to prevent a lateral inclination of the forearm after fractures at the elbow-joint.

FIG. 3. *Kirkbride's Elbow Splint.*

FIG. 4. *Rose's Elbow Splint* (jointed).

FIG. 5. *Day's Elbow Splint* (jointed).

FIG. 6. The author's mode of dressing, with gutta percha, in cases of fracture at or near the elbow-joint. The splint is padded throughout, and the dotted lines represent the successive turns of a roller. The sling, employed to suspend the arm, is omitted for the purpose of bringing into view more distinctly the outlines of the splint.

PLATE IV.

FIG. 1. *Bond's Splint*, for fracture of the Radius at its lower end.

FIG. 2. *Hay's Splint*, for the same fracture.

FIG. 3. *Smith's Splint*, for the same fracture (view of the palmar surface). A. Forearm splint, made of felt, with incurvated margins. B. Circular brass plate, which corresponds to one on the opposite side, and which connects the hand block D, with the forearm splint A.

FIG. 4. *Smith's Splint reversed.* From this view it is apparent that the hand block D, moving upon the pivot E, is capable of describing the radius of the circle C C. The nut F, which communicates with the brass plate of the forearm splint B, retains the hand block at any desired angle.

FIG. 5. *The author's Palmar Splint* for the same.

FIG. 6. The author's splints applied. The curved palmar splint is not in view—only the dorsal. The dotted lines represent the roller. The sling is omitted for the purpose of bringing the other dressings more distinctly into view.

Pl. IV.

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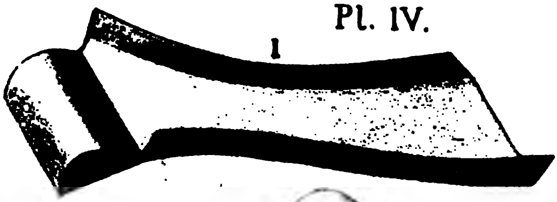

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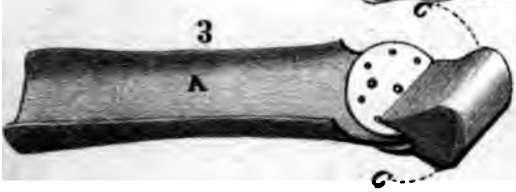

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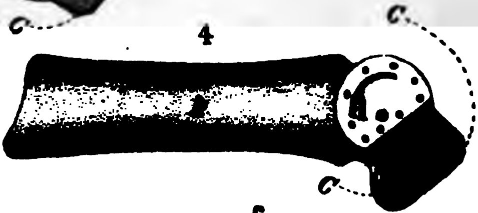

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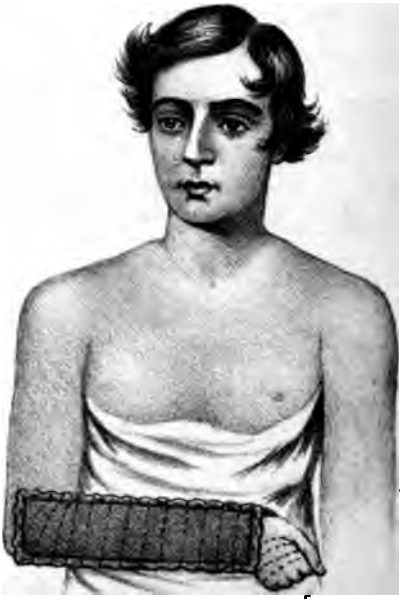

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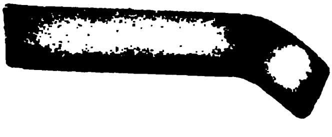

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CASE 16. *Simple fracture. Result imperfect.*

Mrs. Wadsworth, of Buffalo, æt. 51, fell and broke the neck of the right femur, in the year 1841. Drs. T. and W. in attendance. No splints were used. She was not able to walk under six months.

In 1848, seven years after the accident, I found the thigh shortened three-quarters of an inch.

CASE 17. *Simple fracture, without the capsule. Death.*

Dec. 27, 1851, L. F. T., of Buffalo, æt. 42, fell upon a slippery sidewalk, breaking the neck of the left femur. Mr. T. weighed about two hundred pounds, and he fell with his whole weight upon his left trochanter. He was unable to get up or to walk.

Dr. B. was first called, but at his request I was invited to see Mr. T. on the same day, and to take charge of him.

The toe and knee of the left leg were turned out and could not be turned in except by great violence, and by the infliction of great pain. The limb was shortened from one-quarter to one-half an inch. Much pain in the groin and along the whole length of the limb. No crepitus. Drs. S. and B. concurred with me in the opinion that the femur was broken at its neck.

I applied a straight splint, with extension and counter-extension.

Feb. 7th, on the forty-second day (six weeks), I removed finally all of the dressings. On the 9th he sat up. On the 10th he walked about the room with the aid of crutches and a strong male assistant. On the 11th, also, he walked, in the same manner, across the room, came back to his bed, and as he settled his head upon his pillow, he died.

CASE 18. *Simple fracture. Resulting in death.*

Mrs. Sarah Pattison, of Buffalo, æt. 76, slipped and fell on her hip, breaking the neck of the femur, Aug. 26, 1846.

Dr. A., of Buffalo, was in attendance, and subsequently requested me to see the case with him. Mrs. Pattison had been for some time in feeble health, but at the time of the accident she was able to walk out.

Her limb was laid for a time over a double inclined plane, but it was not confined rigidly to that posture. She recovered from the accident so far as to walk, with considerable assistance; but her health had suffered greatly from the shock and from the confinement, and she died a little less than four months after the accident occurred.

CASE 19. *Simple fracture, within the capsule. Result imperfect. Prosecution for alleged malpractice.*

The following report of the trial to which this case gave rise, was written by myself, for publication, in 1849, and contains all of the essential facts:—

"*Prosecution for Alleged Malpractice.*—Supreme Court.—John C. Basset *vs.* John B. Collins and Anthony Barney.

"In the fall of 1843, John C. Basset, of Independence, Alleghany County, aged 48, then in good health, but corpulent, was injured by the upsetting of his wagon and the falling of a box, as was believed, upon his thigh. He was carried into a public house in Woodhull, and there attended by Drs. Reed and Carey. After a careful and complete examination by measuring, etc., they concluded that Mr. Basset had only received a severe bruise.

"He remained two weeks under their care and was then taken home in a bed. Four weeks after the accident, Drs. Collins and Barney were called in, as the left leg was now said to be shortened and turned out. These gentlemen made an examination, and found the leg in the following condition: Shortened an inch and a half; the toes turned out and could not be turned in; the left heel corresponding to the hollow of the right foot; a bunch in the groin like the head of the femur.

"They decided that it was a dislocation of the head of the femur upon the pubis, and with pulleys properly adjusted and carefully operated upon, proceeded to attempt its reduction.

"After two or three minutes' extension and counter-extension, a sound was heard, and a sensation felt by nearly all who were assisting, which was by them described as the sound and sensation usually produced when a dislocation is reduced. The patient was now released from the pulleys and made to get up. The limb was of its original length, and in its natural position, and the tumor in the groin had disappeared. The patient was again laid upon the bed, and dismissed as cured.

"It however appeared in testimony, that a few days after, it was again shortened and turned out; but it does not appear that these facts came to the knowledge of the defendants. It also appeared that the plaintiff did not get the use of his limb so as to be able to dispense with crutches or a cane, in one or two years.

"The limb is now shortened an inch and a half, and moderately turned out; but the motions of the joint are free, and the plaintiff walks with a very slight halt and without inconvenience.

"Drs. Collins and Barney were prosecuted, and the case was tried in January, 1848, before Judge Marvin, but the jury having disagreed, it was again tried before Judge Mullett, in the Circuit of the Supreme Court, held in August, 1848, in the town of Angelica, Alleghany Co., N. Y.

"In the first trial the plaintiff charged that the limb was sound when the defendants took hold of it with the pulleys, and that they then fractured it through the neck and without the capsule.

"In the last trial this was not claimed, but it was alleged that the original accident was probably a fracture without the capsule, and without displacement; that when examined by Drs. Collins and Barney, a displacement had occurred, and that the defendants were chargeable with criminal negligence or ignorance in not discovering that it was a fracture; and consequently for subjecting the plaintiff to the useless pain of extension with the pulleys, and in not applying subsequently a retentive apparatus, since through this omission the plaintiff had a shortened and crooked leg.

"On the defence it was admitted that the original accident was a fracture without displacement; but that it was *within* the capsule and near the head of the bone; that its being within the capsule and near the head could alone satisfactorily account for the "bunch" in the groin, which disappeared with the reduction, and for the slowness of the subsequent restoration of the limb. It was claimed, also, that the signs described by the witnesses were the ordinary signs of a dislocation upon the pubis, and would be likely to deceive the most skilful surgeon; that several eminent surgeons had mistaken fractures of the thigh for dislocations; that the extension with the pulleys did him no permanent injury; that the subsequent treatment pursued by the patient in this case, viz: keeping his bed for a few days and then getting about on crutches, would have been the proper treatment had the exact nature of the accident been fully known; and finally, that the patient had as good a limb as can ordinarily be expected in this fracture, under the most skilful management.

"The examination of the numerous witnesses having closed, the jury were addressed by the distinguished gentlemen, Messrs. Doolittle and Skinner, for the defendants; and the Hon. Judge followed with a most pungent and impressive charge, in which the jury were instructed to disregard all mere appeals to their prejudices, and especially to reject that counsel which would advise them to look upon the medical profession as an *oppressive and aristocratic mono-*

poly, and to decide the case upon the facts as drawn from the witnesses on the stand.

"The jury retired, and in a few minutes returned a verdict for the defendants.

"The defendants in this case were men who have long practised both medicine and surgery in the county of Alleghany; Dr. Barney, at Independence, and Dr. Collins, at Alfred, and they both occupy a high position in the estimation of the public, as men of skill and worth; and it is gratifying to know that in the mind of the Hon. Judge, as well as of the intelligent jury, they received a full and unqualified acquittal from the charge of any degree of negligence or unskilfulness."

CASE 20. *Simple fracture without the capsule. Result imperfect.*

Mrs. Mary Goodwin, æt. 84, fell from a chair, striking on the left trochanter, Oct. 2, 1856. In the following week, Oct. 12, she was admitted to the Buffalo Hospital of the Sisters of Charity.

I found the toes of the left foot everted, and after considerable manipulation I detected a slight crepitus. Limb shortened one-half or three-quarters of an inch. On moving the limb she complained of pain, especially near the trochanter minor.

I laid her upon her back, with pillows under her knees, applying no dressings or apparatus. Her health evidently declining, she was ordered beer, good diet, and tonics.

In about six weeks she was able to get out of bed and to rest upon crutches. The fragments were then firm, and I have no doubt, united by bone. The limb still remains, five months after the accident, slightly everted, and shortened one-half or three-quarters of an inch. She is walking about the hospital a little on crutches, but she cannot yet bear any weight on the limb.

CASE 21. *Simple fracture without the capsule. Result imperfect.*

Frederick Clever, of Buffalo, æt. 54, was thrown from his carriage upon the frozen ground, striking upon his right trochanter, Dec. 21, 1856. Dr. H., of Buffalo, was called, and recognized the accident as a fracture of the neck of the femur, without the capsule. He laid the limb carefully over a double inclined plane. Dr. H. had found the limb everted, and shortened one inch, immediately after the accident, but he could not detect any crepitus.

On the following day, Dr. H. requested me to see the patient with him. The limb was still shortened one inch. No crepitus, nor eversion. No ecchymosis, nor swelling. He could not lift his limb, but it did not hurt him very much to have it moved, except near the trochanter minor.

On the third or fourth day, Dr. H. applied my long straight splint, and removed it finally, Feb. 1, 1857, six weeks from the time of the accident. The fragments then seemed to be firmly united. The same shortening as at first. Soon after this, he began to walk on crutches.

Through Trochanter Major.

CASE 22. *Simple fracture. Fragment displaced.*

James Redick, a travelling showman, æt. 23, fell, in Aug., 1848, from a high wagon, striking upon his left hip. When he got upon his feet he was unable to walk. Dr. W. was employed. Two weeks after the injury was received, I was requested to see him. I found the trochanter major carried upwards towards the crest of the ileum half an inch, and also slightly sent in: but the thigh was not shortened. There was no crepitus.

Oct. 11, 1848, I examined the patient, and found no change in the position of the fragment. The functions of the limb were, however, almost completely restored.

Below Trochanter Major (Upper Third).

CASE 23. *Simple oblique fracture. Result imperfect.*

Wm. Borton, æt 27, a healthy English laborer, was thrown from a load of wood, Jan. 28, 1857, breaking his right femur near the lower end of the upper third. Fracture oblique and simple.

I saw him a few hours after the accident occurred, and immediately dressed the limb carefully, with Dr. Charles Ap. Bowen's straight splint.

Finding my patient in excellent health, and with moderate swelling of the limb, and disposed to aid me in every way to secure as perfect a result as possible, with no complications of any kind to embarrass me, I determined to ascertain what my own skill could do, and to spare no time or pains in the effort. Everything, therefore, was made as tight and strong as the patient would bear. From this time, during four weeks, I visited him every day, with but two or three exceptions. At almost every visit, I tightened the screw, and readjusted such of the dressings as were in any degree loose.

On the 4th of February, six days after the occurrence of the fracture, I substituted my own single straight splint for Dr. Bowen's, in order that I might make both extension and counter-extension at the same moment, by means of the screw placed at the foot.

Feb. 17, three weeks after the occurrence of the fracture, I found the bones united pretty firmly, but I did not relax my extension until the end of four weeks. After this date, I visited him less often—once in two days—and only tightened the dressings moderately from time to time.

March 10, six weeks after the fracture occurred, I removed all dressings, and found the limb shortened three-quarters of an inch, the upper fragment lying upon the outside (not in front) of the lower, and being plainly felt on the outside of the limb. The line of the whole limb was perfect. There were no excoriations in the perineum, or about the ankle. Adhesive straps were used in extension.

This limb had been dressed with extraordinary care, with numerous carefully made junks to protect the joints, &c., and with nicely moulded felt splints about the thigh, with rollers, &c. &c., and never was the extension allowed to become relaxed; yet from the beginning to the end, the measurements carefully repeated always gave the same shortening, viz., three-quarters of an inch.

CASE 24. *Simple fracture. Result nearly perfect.*

Martha Barker, æt. 7, was run over by a loaded wagon, Aug. 2, 1852, breaking her thigh through its upper third.

Dr. L. was immediately called, and dressed the limb temporarily; on the following day he sent for me.

Assisted by Dr. L., I applied my own straight splint, with gutta percha side splints. We used also the adhesive plaster straps for extension.

Sept. 3, the splints were finally removed. Limb perfectly straight, and shortened one-quarter of an inch.

Sept. 10, 1856, four years after the accident, we could not discover where the fracture occurred.

CASE 25. *Simple oblique fracture. Union delayed. Result imperfect.*

Sidney Allen, of Rochester, aged about 30 years, was thrown from a carriage, May 16, 1840, breaking his right femur just below the trochanter major. Direction of fracture, obliquely downwards and backwards. He was also severely stunned by the fall.

I dressed the limb with Gibson's modification of Hagedorn's splint, making counter-extension, however, by means of a perineal band. I applied also lateral splints with bandages, &c., and made extension with a silk lined gaitre. At the end of fourteen days, slight ulceration had occurred upon the instep, and the perineum was very intolerant of pressure. I removed, therefore, the straight splint and applied a double inclined plane. During the six first weeks, I drew off his urine daily with a catheter, the bladder having for the time lost the power of expulsion of its contents. Bony union was delayed until about the tenth week, and, before it was accomplished, it became necessary to place him again upon the straight splint.

The thigh is shortened three-quarters of an inch, and he limps very badly.

CASE 26. *Simple fracture. Result imperfect.*

G. B., M. D., of Livingston Co., N. Y., fractured his right femur in the year 1845. The fracture was oblique, and about three inches below the trochanter major.

Dr. C., late Professor of Anatomy at Pittsfield Med. College, was requested to take charge of the limb, and, at the instance of Dr. B. himself, he treated the case throughout with a double inclined plane.

I saw Dr. B. at my office, May 12, 1847, and found the thigh shortened one inch and a half, but firm, and nearly as useful as before.

CASE 27. *Simple fracture. Result imperfect.*

E. Richardson, æt. 42. Simple fracture through the upper third. (I have no record of the name or residence of the surgeon.)

Four years after, I found the thigh shortened three-quarters of an inch, and slightly bent at the seat of fracture.

CASE 28. *Simple fracture. Twice broken at same point. Result imperfect.*

Morris Cassady, æt. 9, fractured his right femur through its upper third. Surgeon Shields, of Ireland, treated the fracture each time.

Thirty-one years after, I find the thigh shortened one inch and a half. The point where the fragments overlap can be distinctly felt. He walks with only a slight halt.

CASE 29. *Simple fracture. Result imperfect.*

Antonio Gode, of New York, æt. 55, fractured the thigh through its upper third. He was treated at the New York City Hospital, with straight splints and extension. The extension was made with adhesive plasters.

June 10, 1852. When I examined the thigh, six weeks after the fracture had occurred, it was united with a shortening of three-quarters of an inch. The patient says the same thigh had been broken before at the same point, and that it shortened some at that time, but that it is shorter now than before.

CASE 30. *Simple fracture. Result imperfect.*

John Cartwright, of Tonawanda, æt. 49, fractured his femur through its upper third.

Dr. L., of Tonawanda, had charge of the case. He laid the limb upon a double inclined plain.

Seven weeks after the fracture had occurred, I examined the limb, and found it united with a shortening of half an inch.

CASE 31. *Simple fracture. Result imperfect.*

John Moffat, of Buffalo, about one year old, fractured the right femur near the lower end of the upper third, by a fall from his bed.

Dr. W. in attendance. The lad was very fat, and the application of splints was rendered exceedingly difficult. No extension or counter-extension was used, nor a double inclined plane, but lateral splints were applied with as much care and diligence as possible.

One year after the accident, April 15, 1852, I found the bone slightly bent forwards at the seat of fracture, and, when he walked, the toes were inclined to turn inwards. I could not detect any shortening of the limb.

CASE 32. *Simple fracture. Result imperfect.*

John Redman, of Buffalo, æt. 40, was admitted to the hospital with a fracture of the right femur near its upper end, Aug. 8, 1849.

The fracture was simple and oblique. On the following day, I applied a paste bandage to the leg and foot.

On the 10th, I applied side splints, and secured the extending and counter-extending bands to a straight splint.

With only slight modifications, these means were continued until the 26th of August, a period of eighteen days, when a double inclined plane was substituted for the straight splint.

Sept. 11, all dressings were removed, and the bones were found to be united with a shortening of half an inch.

CASE 33. *Simple fracture. Result imperfect.*

William Murphy, æt. 13, fell from a pile of boards, Oct. 28, 1855, fracturing the left femur at the lower end of the upper third. He fell upon his side. Fracture simple.

Dr. B., one of the hospital surgeons, dressed the leg at my request. He applied Potter's straight splint, making extension with adhesive straps, and counter-extension with a perineal band. A roller was applied to the whole limb, and also four lateral splints to the thigh, made of binder's board.

I subsequently took charge of the case, and although I examined the limb daily, and took great pains, by renewing and retightening the dressings, to render the cure as perfect as possible, yet the bone united with a shortening of one inch. The axis of the limb was, however, as nearly straight as this amount of overlapping would permit.

January 5, 1856, ten weeks after the accident, he was still walking on crutches.

CASE 34. *Simple fracture. Result imperfect.*

Almon Carpenter, of Buffalo, æt. 5, was struck by a heavy gate, Aug. 16, 1852, breaking his left thigh near the lower end of the upper third.

On the same day I applied a straight splint, with side splints.

Sept. 13th, four weeks after the accident occurred, I removed all dressings. The fragments were united, but with an overlapping of three-quarters of an inch. Limb straight.

I did not reapply the splints. At the end of eight weeks he was walking, and without any perceptible halt.

CASE 35. *Simple fracture. Result imperfect.*

Mrs. S. C. P., of Buffalo, about 55 years old, fell down a flight of steps, Feb. 24, 1853, breaking her thigh near the lower end of the upper third. Dr. T. and myself in attendance.

I dressed the limb with Welch's splint, using it at first as a double inclined plane. On the seventh day I converted it into a straight splint, and laid her upon a fracture bed. I used adhesive plasters for extension.

April 7th, I removed all dressings. Limb was found to be straight, but shortened half an inch. The knee and ankle remained very stiff, and lame for many months, but she was at length able to walk as well as before.

CASE 36. *Simple fracture. Result imperfect.*

"Mrs. E. Howard, of Buffalo, æt. 47, was injured by the upsetting of her sleigh, the sleigh falling upon her left side, Dec. 24, 1854. Dr. L., of Buffalo, was called, but on the same day requested me to take charge of the case with him.

"I found her a feeble, dropsical woman. The left thigh was broken at its neck. The whole limb was greatly swollen and exquisitely tender. The toes were everted strongly, and could not be moved. The limb was shortened one inch. The muscles were frequently contracted spasmodically. We gave her chloroform, and then detected a distinct crepitus.

"She was laid upon her back, in bed, with her knees over a couple of feather pillows. The foot was supported by bolsters. On the following day I laid the limb over Welch's double inclined plane, using great care to cushion and support the limb. My purpose, in laying the limb on this splint, was to support and steady it in such a manner as to save her from the great pain which she suffered whenever the limb was in any way disturbed. Nothing, however, in this respect was gained, and I soon changed it for my own straight splint.

"Jan. 5, 1855. She still continued to suffer greatly, and I laid aside all apparatus, and placed her on one of Coolie's fracture beds."

The above is the record of this case which I had prepared for publication, when, Sept. 8, 1856, I visited Mrs. Howard at her house, and found her confined to her bed with ascites, and other chronic maladies. She permitted me to examine her broken limb, when, for the first time, I found unequivocal evidence that the fracture had occurred through the *shaft* of the femur, instead of through the *neck*. The dropsical and inflammatory swelling had now entirely disappeared from this part of the limb, and the bone could be distinctly felt bent forward at the seat of fracture, and irregular in its form. This part of the limb also remained tender. The limb was shortened one inch. She has never walked without a crutch or cane since the accident. Her knee, she says, has been the greatest source of lameness.

It is due to myself to say, that I was in some doubt during the first six or seven days, as to whether it might not be a fracture of the shaft rather than of the neck. The swelling of the limb was always such that, even when she was under the influence of chloroform, a satisfactory diagnosis was difficult: but after several careful examinations I felt quite certain that the fracture was through the neck, and so recorded it.

CASE 37. *Simple fracture. Re-fractured at same point. Result imperfect.*

James Leacock, æt. 29, fractured his thigh at the lower end of the upper third, by a fall from a height upon the ground. Dr. P., of Portageville, Livingston Co., N. Y., was employed. He treated the limb with a straight splint, and in about six or seven weeks he was able to leave his bed, with the limb shortened about three-quarters of an inch. This is the statement made to me by Leacock himself.

Dec. 27, 1848, about nine months after the first fracture, he fell upon his knee with moderate force, and re-fractured the limb at the same point.

On the same day, he was admitted to the Buffalo Hospital of the Sisters of Charity, and I applied my own straight splint, with lateral splints, &c. The limb was easily brought down so as to be of the same length as before the last fracture occurred; that is, to within three-quarters of an inch of the length of the opposite limb.

On the 29th, vesication had occurred upon the top of the ankle, from the pressure of the gaitre. The extending bands were loosened, and the gaitre readjusted. Notwithstanding great care was used to prevent this event, a slough occurred above the heel on the 3d of June. From this time to Feb. 16, we were compelled, by his constant complaints, and by his restlessness, to change the mode of extension and support often. The extension was made from above the ankle, from above the ham, from above the knee, alternately, or at the same time, with adhesive plasters and cotton, or flannel rollers; once, for a short time, the double inclined plane was used.

Feb. 16, fifty-two days from the commencement of the treatment, we found the bone united, and the limb of the same length as before; that is, shortened three-quarters of an inch.

In this case, there were present the usual sources of difficulty, to which were superadded an exceedingly irritable temperament, and the previous occurrence of fracture at the same point.

CASE 38. *Simple fracture, occurring four times consecutively at the same point. Very great shortening.*

J. H. Frick, of Williamsville, Erie Co., N. Y., sent for me, June 18, 1849, having broken his left femur sixteen days before I saw him, by jumping from a wagon. The fracture was at the lower end of the upper third.

This is a remarkable case. When only 16 years of age, he first broke this thigh by a fall on the sidewalk. A Thompsonian, who was living at Williamsville, dressed it with only short side splints. Union was delayed, and, at the end of nine weeks, he sent for a man by the name of Smith, who had once been a blacksmith, but who was now a Doctor Smith, and set bones instead of horseshoes. Smith bound the limb with leather, and after five weeks more union occurred. One year from this time, he broke it again, while carrying a moderate weight in his hands. Smith dressed the leg this time also, and in the same manner. The bone united in about two weeks. At the age of 22, he broke it again. So Smith said. And Smith treated it successfully again. Each time the fracture was at the same point. On this last occasion, he employed an experienced surgeon, Dr. Van Pelt, of Williamsville. Dr. Van Pelt had treated it with a straight splint, and the bone seemed already firm on the sixteenth day. The limb was shortened, according to measurements made by Drs. Van Pelt, Hawley, and Mr. Otis, medical student, with myself, three inches and seven-eighths. It was, however, as perfect in all respects as it was before the last fracture.

CASE 39. *Simple fracture, complicated with other injuries, resulting in death.*

Thomas Ryan, of Buffalo, æt. 14, was injured by the cars, at Syracuse, breaking his left thigh just below the trochanter minor, severely bruising the right leg, and rendering necessary the amputation of the right arm above the elbow joint. The amputation was made, and the limbs dressed, by a surgeon in Syracuse.

About three weeks after the accident occurred, he was brought to Buffalo, and I was requested to see him. The stump had not yet healed. There was a large abscess discharging freely in the vicinity of the right knee. The broken thigh was resting upon

Day's splint, the splint being extended. Extension was made with adhesive plasters, but there was no counter-extending band. It was neatly bandaged, and carefully adapted side splints supported the fragments. No union existed between the ends of the fragments, and they were overlapped three-quarters of an inch. I reapplied the same dressings carefully, so far as it was necessary to do so, and dressed the wounds. On the following day, an empiric was employed, and in about one week he died.

CASE 40. *Simple fracture. Result perfect.*

——— Rohan, an Irish lad, of Buffalo, N. Y., æt. 9, fell, July 12, 1851, and broke his left femur about its middle.

I dressed the limb with my own straight splint, using extension and counter-extension; the extension being made with a paste gaitre. I also applied side splints.

Aug. 9th, four weeks from the time of the fracture, union was complete, and without shortening or deformity. I removed the long splint, but continued the side splints.

At the end of three months the limb was in all respects perfect.

CASE 41. *Simple fracture. Result perfect.*

John Gortz, of Buffalo, æt. 13, fractured his — femur in its middle third, Feb. 21, 1849. On the same day he was received into the Buffalo Hospital, and we applied a starch bandage from the knee to the toes.

Feb. 24, the bandages being dry, the straight splint was adjusted, and extension made. Lateral dressing was also applied.

March 14, the fracture appeared firm.

March 23, the bandages and splints were removed, and the leg was found sound and perfect. No excoriations had occurred on the foot or leg.

CASE 42. *Simple fracture. Result perfect.*

Wm. C.——, æt. 9, was kicked by a horse in the fall of 1852, in consequence of which his right thigh was broken about its middle. The fracture was simple. Dr. C., of Pendleton, N. Y., had charge of the limb.

Oct. 30, 1853, one year after the accident, I found the thigh not shortened, but the bone was bent forwards and a little outwards at the seat of fracture.

CASE 43. *Simple fracture. Result perfect.*

Samuel Benson, æt. 3. Simple fracture of the thigh near its middle. A surgeon in Johnstown, N. Y., was employed.

Sixty-three years after I find the limb in every respect as perfect as the other.

CASE 44. *Simple fracture. Result perfect.*

Peter John, æt. 15. Simple fracture of the femur near its middle. The fracture was treated by a surgeon in Antwerp, Belgium.

Thirty years after I could not find any traces of the accident.

CASE 45. *Simple fracture. Result perfect.*

—— Madison, of Buffalo, æt. 3. May 2, 1849, he broke his femur near its middle. Dr. S., of Buffalo, was called, and on the same day I met him in consultation. We dressed the limb with a roller carefully applied from the toes upwards, and laid it over a double inclined plane made of pillows.

One year from this date I found the limb sound and perfect.

CASE 46. *Simple fracture. Exact result unknown.*

Isaac Fridenburgh, æt. 5, was hanging on to the back of a wagon, July 3, 1845, when his right leg caught in the wheel and broke the femur a little below its middle.

I found the fracture nearly transverse. I applied a roller to the foot and leg, and scultetus bandage to the thigh, employing a sock gaitre for extension. The limb was secured in place by my long straight splint.

The next day his family physician, Dr. W., took charge of him, and I only know of the result that he recovered with a useful limb, and that he walks without any halt.

CASE 47. *Simple fracture. Result imperfect.*

Margaret Hamilton, æt. 8, was admitted to the hospital of the Sisters of Charity, Dec. 18, 1856. On the same day she had had her right thigh broken near its middle, by having fallen under the wheel of a wagon upon which was a small load of wood. The skin was much bruised at the seat of fracture, and the whole thigh was considerably swollen. It was evident also that one wheel had traversed the leg of the same extremity, a little above the ankle, as it was also swollen and the skin showed marks of violence.

I dressed the limb carefully with my double straight splint, constructed for children, making extension with adhesive straps and a screw.

Jan. 15, four weeks after the fracture had occurred, the fragments were well united, but with an overlapping of half an inch. During the whole course of the treatment I personally inspected the dressings every day, and almost daily they were readjusted and made snug. No excoriations occurred during this time, except a slight abrasion in the perineum.

On the sixth week she began to use crutches.

CASE 48. *Simple fracture. Result imperfect.*

E. S. King, of Buffalo, æt. 19, was thrown from a sleigh Dec. 5, 1854, breaking his left femur a little below its middle. Fracture simple and oblique. By request of his family physician, I took charge of the case.

Assisted by Dr. John Boardman, I applied a straight splint, with adhesive plaster extension, and with side splints.

Jan. 6, 1855, five weeks from the time of fracture, I removed the long splint. The fragments were united, and with some overlapping, but the line of the bone seemed perfectly straight; the bone could at this time be distinctly felt.

On the 15th, six weeks after the fracture, Dr. Howell being present, it was again noticed that the line of the bone seemed perfectly straight, although the limb was shortened one-half or three-quarters of an inch. Again, on the 25th, Dr. Nelson and myself made the same observation.

About this time he left his bed, and one year after I found the limb considerably bent outwards at the seat of fracture.

Whether this limb was so much bent when I examined it on the 15th and 25th, and the bending could not be traced owing to the presence of some swelling and temporary callus, or whether it occurred when he began to walk, I cannot say; I think, however, there was too little swelling immediately after the dressings were removed to have concealed the present deformity; indeed, both Dr. Nelson and myself feel quite certain that the bending must have taken place subsequently, but I do not feel warranted in affirming positively that such was the fact.

CASE 49. *Simple fracture. Result imperfect.*

Joseph Gallmeyer, æt. 9. Aug. 15, 1854, he fell from a tree, a height of about eight feet, breaking his right femur. The blow

DEFORMITIES AFTER FRACTURES.

BY

FRANK HASTINGS HAMILTON.

"If the prospect of that which remains to be done, after the labors of so many ages, tends to abate hope and discourage endeavor, yet it should be remembered that no man can determine the measure of success which may be connected with industrious research and zealous exertion."

PEARSON.

EXTRACTED FROM THE
TRANSACTIONS OF THE AMERICAN MEDICAL ASSOCIATION.

PART THIRD.

PHILADELPHIA:
T. K. AND P. G. COLLINS, PRINTERS.
1857.

PREFACE.

WHEN I had nearly finished this last section of my *Report on Deformities after Fractures*, I found that its great length would compel me to seek some mode of abridgment. I withdrew, therefore, as being of the least value, all the chapters relating to the bones of the trunk, and also the chapter relating to the bones of the foot. I then set myself to work diligently to reduce the still enormous dimensions of the remainder. With what success you will see.

How is it possible, in a matter so entirely new, where everything has to be proven from the beginning, to dispense with the record of the cases, or to abridge their yet inconsiderable number? If the report admits of retrenchment, it is, I think, only in rejecting what relates to treatment; and upon this subject, the Committee of Publication must exercise its own judgment. I confess, however, that this seems to me to be the fruit of the plant, growing naturally upon it, and without which it would be only a very crooked and barren stalk.

Whether these results ought to be regarded as "successful," must be left to the judgment of every man to decide. For myself, I do not hesitate to call them so, when compared with almost any other department of mechanical surgery, and especially when viewed in connection with the extraordinary difficulties which constantly embarrass this branch of our art. Yet they are by no means "satisfactory," nor are they what we may hereafter hope to attain, nor, perhaps, are they what, in the hands of a few skilful surgeons, may even now be attained. I believe, however, that the average skill of the world, wherever the observations shall be carefully made, will present no better success; but not until those who think differently offer some better testimony than vague impressions, or dogmatic assertions, will their opinions merit respectful attention, or demand a serious reply.

notice a marked difference during the last month. Dr. W. was present with me at this examination. The limb measured just three inches less in length than the other; the motions at the joint, or at the seat of fracture, were tolerably free; his toes were neither inclined outwards nor inwards, unnaturally. The trochanter was not much flattened, and seemed to move on a long radius when the thigh was rotated. He used crutches, and bore no weight on the limb in walking. The thigh seemed to give way, or "spring," when he settled his body upon the limb.

Case 3. *Simple fracture. Result imperfect.*

Eddy, of Potter's Corners, Erie Co., N. Y., æt. 78, fell, July 28, 1847, striking on the trochanter major. He fell about four feet.

Dr. N. in attendance. Dr. N. laid his limb over a double inclined plane.

I was requested to see him in consultation thirty-six hours after the accident. The leg was everted, and any attempts to rotate it in the opposite direction were very painful. I could not detect crepitus. The trochanter was carried upwards and backwards, and the limb shortened one inch.

I recommended a continuance of the treatment for the present. Subsequently, a straight splint was employed, but only for a short time.

I have never seen Mr. Eddy since, but I have learned from Dr. N. that he was able to get upon crutches in about eight weeks, and that, during the four or five years in which he continued to reside in this country, he used a cane, and walked with a manifest halt. Precisely how much the limb was shortened, he was unable to say, yet he knew it was shortened.

Case 4. *Simple fracture without the capsule. Result imperfect.*

Mrs. Jane Stewart of Buffalo, æt. 73, fell, July 4th, 1847, while descending a flight of steps, striking upon the trochanter major of the right side.

Dr. B. in attendance. Dr. B. requested me to see Mrs. S., on the twenty-ninth day after the accident. No splint had been applied. The limb was shortened half an inch. The leg was everted, but could be easily rotated inwards. No crepitus. The principal pain which she suffered was below the trochanter major. The whole limb was œdematous. She had also incontinence of urine. Dr. B. had been obliged to give her opium freely, to alleviate her pains.

No change in the treatment was recommended.

During the first three or four months she was unable to lie down, and for about one year she was unable to walk. From this time, she gradually recovered her health and strength, and walked with considerable ease, but with a halt. She survived the accident five years, her death having no connection with this injury. The limb was never measured after I saw her.

CASE 5. *Simple fracture within the capsule. Result imperfect.*

Mrs. Wright, a German woman, living in Buffalo, æt. 66, broke the right femur through its neck, by a fall upon the ice, Jan. 25, 1850. She was admitted to the hospital on the same day.

I could not detect any crepitus, nor was there any shortening of the limb; the toes were turned out, so as to lie flat upon the bed. We suspected a fracture of the neck of the femur. The patient was laid in bed upon her back, and pillows were placed under her knees.

Feb. 1. We found the leg shortened, and we laid it over a double inclined plane. On the 10th of February, she had bed-sores, and the splint was removed, the limb being placed again over pillows.

This treatment was continued until the 28th of Feb., when she left the hospital, and I have not seen her since. Shortly before she left, we found the thigh shortened half an inch.

CASE 6. *Simple fracture. Result imperfect.*

Mrs. Catharine Brenoe, æt. 50, broke her right thigh through its neck, either in February or March, of 1852. She was standing upon a box, three feet high, when she fell, striking upon her right hip.

Dr. H. was called. She was laid upon a bed, but no splints were applied.

July 20, 1852, she was admitted to the Buffalo Hospital, of the Sisters of Charity. Dr. W.'s service.

Oct. 1, 1853, I found this woman in my ward. During all of my previous service, she had been in a private ward, and my attention had not been called to her. She had had no surgical treatment beyond confinement in bed, and this, I understand, was voluntary. Her thigh was shortened one inch and a half, and rotated outwards. The trochanter major rotated on a very short axis. There was also a kind of click, or crepitus, at this point. It hurt her very much to abduct the thigh.

I directed that she should be got out of bed into a chair. This, with great labor, was soon accomplished; but, after a few months, I found her again lying in bed, and I could never again persuade her to get up. There was no necessity for this, I think, beyond her own strong disinclination to do otherwise.

Nov. 1, 1856. Nearly five years after the accident, she still occupies the same bed, yet her health is tolerably good, and no sufficient reason exists why she should not walk about or sit up.

CASE 7. *Simple fracture. Result imperfect.*

Mrs. Catharine Langen, æt. 84, while carrying a bundle of wood, her foot slipped and she fell, striking on the left trochanter. She was admitted to the hospital on the following day (Jan., 1856). Dr. B., hospital surgeon, in attendance.

Dr. B. could not discover either crepitus or shortening, but the foot and knee were everted. She was directed to lie still in bed. Subsequently, Dr. B. thought that he detected crepitus, but I was unable to do so at any time.

She left the hospital, Aug. 31, 1856, about eight months after her admission, unable to walk, except with crutches. The thigh is shortened half an inch; toes not everted. The trochanter major feels broad and flattened, and the upper part seems to be thrown inwards towards the body. I now suspect that this was a fracture of the neck close to the trochanter, and involving the trochanter itself; and also that it is a case of impaction of the neck. The great breadth of the trochanter is probably due to an abundant ossific deposit. I believe it has united by bone.

CASE 8. *Simple fracture. Result imperfect.*

James McLaren, æt. 65. Admitted to the Buffalo Hospital, Sept. 8th, 1855, with a fracture of the left thigh-bone through the neck. His account of his injury is that, on the 28th of August, he was struck violently on the inside of his left thigh, near its upper end. The blow was, no doubt, sufficient to break the thigh-bone, but it is difficult to understand how it should have been broken through its neck by a blow given in that direction.

He was at first seen by Dr. H., who called it a fracture of the neck of the femur. I do not know what treatment he adopted. When he became an inmate of the hospital, Dr. S. laid him in a modification of Gibson's splint.

Oct. 1, 1855, I found him still lying within the same apparatus, but without extension or counter-extension being made. The thigh was shortened three-quarters of an inch. I directed him to get up and use crutches. No dressings were subsequently applied.

March 31, 1856. He was still in the hospital, walking with a cane, and with some halting in his gait.

CASE 9. *Simple fracture. Result imperfect.*

Catharine Bletzer, æt. 79, fell upon an icy side walk, in Dec., 1855, and was admitted to the Buffalo Hospital, on the 20th of the same month.

Her left thigh was broken through its neck. As she lay upon her bed, the left side of the pelvis was drawn up, and her toes were everted. I directed pillows to be placed under her knees, and that she should remain upon her back, but that, as soon as possible, she should get up and walk about with crutches. She remained, however, nearly one year in bed.

Feb. 10, 1856. She left the hospital, still unable to walk, and having only for a short time found herself able to sit up.

CASE 10. *Simple fracture without the capsule. Result imperfect.*

R. W. S., late surgeon in U. S. army, of North East, Pa., æt. 31, fell from a height, striking upon his feet, and breaking the neck of the right femur.

His limb was laid on a straight single inclined plane, the foot being six inches higher than the hips. Extension was made by means of weights attached to bands passing over a pulley at the foot of the splint; the weight of the body accomplished the counter-extension. At the end of ten weeks, he left the splint and began to use crutches.

Thirty-six years after the accident, I examined the limb, and found it shortened one inch and three-quarters. The union of the fragments was very firm and unyielding, and seemed to have been effected through the medium of bone. The foot and leg were slightly everted. Notwithstanding this amount of shortening, and although he used no extra heel to increase the length of the limb, he walked with only a moderate halt.

CASE 11. *Simple fracture. Result unknown.*

Isaac Lang, of Colden, Erie Co., N. Y., about 40 years old, broke his left thigh through its neck. I saw him Nov. 3, 1853, fourteen hours after the accident occurred. The messenger said that the

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attending surgeon, a very intelligent gentleman, called it a dislocation. Such, indeed, I found was his opinion, after my arrival at the house.

I found the hip much swollen; the thigh rotated outwards, and shortened half an inch. Having placed him under the influence of chloroform, crepitus was easily detected.

I applied my own straight splint with adhesive plaster extension.

He recovered in the usual time, but I have never learned the exact result.

CASE 12. *Simple fracture within the capsule. Result imperfect.*

Mrs. F. W., of Buffalo, æt. 51. Feb. 3d, 1847, she slipped and fell upon an icy board, striking upon her left trochanter major. Dr. B. was called. There was no shortening of the limb, but the foot was slightly everted. Yet the doctor apprehending a fracture, had directed her to remain quiet in bed and upon her back, with her knees over a double inclined plane.

On the third day I visited Mrs. W. with Dr. B. The limb was now shortened half an inch. No crepitus. I left her in charge of Dr. B. She remained in bed ten weeks.

May 29, 1854, seven years after the accident, I found her walking with a cane, and limping a good deal. The limb was shortened. The thigh and leg were slightly rotated outwards. She had suffered more or less pain ever since the accident occurred, and at times the pain had been very great. She had been blistered and cupped; setons had been used, and cold baths. The latter alone had benefited her.

Sept. 10, 1856, nine years after the accident, I found her still walking with a cane, but able to walk without it. Her toes turn out, and her thigh is shortened one inch. The flexors of the thigh are not sufficiently strong to lift the limb when the knee is bent.

CASE 13. *Simple fracture. Result imperfect.*

Mrs. Dally, of Buffalo, æt. 67, fell, Oct. 19, 1853, from a trunk upon which she was standing, and struck upon her right hip.

I saw her soon after the accident occurred. The thigh was shortened half an inch. Toes everted. Hip excessively painful when moved; the pain was also accompanied with frequent spasmodic contractions of the muscles about the hip. No crepitus.

I laid her upon her back, with her knees over pillows, so as to elevate them very slightly. I supported the foot also in such a was received upon the outside of the femur. Fracture simple. The hospital record does not show in what part of the limb the fracture occurred, but I think it was in the middle third.

He was carried immediately to the Buffalo Hospital. Dr. S. in attendance. A modification of Gibson's splint was employed.

Oct. 1, forty-six days after the accident occurred, I found the bone united, and shortened half an inch. We removed all dressings immediately, and on the 6th of Oct. he left the hospital.

CASE 50. *Simple fracture. Result imperfect.*

Samuel Logan, æt. 18, was struck by the boom of a vessel, breaking the left femur near its middle. Fracture simple.

He was carried to the Marine Hospital at Buffalo on the day following, Nov. 14, 1855. The limb was dressed by Dr. W., marine surgeon, and myself. We applied a straight splint, using adhesive plaster for extension. No side splints for several days. On the twenty-third day the fragments were partially united.

Dec. 13. Bony union complete. Limb shortened three-quarters of an inch. Does not limp at all.

CASE 51. *Simple Fracture. Result imperfect.*

George Hanson, of Buffalo, æt. 10. George was thrown down on the sidewalk by another boy, the boy falling also upon his thigh, and breaking it near the lower end of the middle third.

Assisted by Dr. F., who was at first called, but who had requested me to take charge of the case, I applied my own straight splint, with suitable side splints, &c. We used adhesive plaster for making extension.

Four weeks after I found the bone united, and shortened half an inch; the overlapping of the fragments being very perceptible to the touch. The limb was straight.

April 14, 1853, six weeks after it was broken, he walked on the leg, and on the first of May I saw him walking with only a slight halt.

CASE 52. *Simple fracture. Result imperfect.*

Philip Kneck, æt. 12. Simple fracture of the left femur a little above its middle, occasioned by the fall of some heavy boards upon his thigh, Sept. 13, 1855.

I applied immediately my own straight splint, with side splints, using adhesive plaster for extension. At the end of five weeks, I found the bone firmly united and straight, but with an overlapping of half an inch. He does not limp.

CASE 53. *Simple fracture. Result imperfect.*

Frederick Frank, æt. 11. Fracture of the right femur near its middle. Simple. He was admitted into the Buffalo Hospital, April 16, 1853, eleven weeks after the fracture had occurred.

Dr. J., of Buffalo, had taken charge of the limb, and had employed in its treatment a straight splint. The bone was firmly united and straight, but it was shortened half an inch.

CASE 54. *Simple fracture. Result imperfect.*

James Farland, æt. 6. James fell from a loaded wagon, Sept. 18, 1853, and, after reaching the ground, a stick of wood fell upon his right thigh, breaking it below the middle. He did not come under my care until Oct. 1st, thirteen days after the accident. I found the thigh then dressed with Gibson's splint, shortened three-quarters of an inch, and not united.

Oct. 2, I substituted my own splint for Gibson's, and made extension and counter-extension with a perineal band and adhesive plasters, using also side splints, rollers, junks, &c. &c.

Oct. 18, I found the bone united.

Oct. 26, I removed all dressings. Limb shortened one-quarter of an inch, and slightly bent forwards and outwards at the point of fracture.

After a few days, he was dismissed from the hospital, cured.

CASE 55. *Simple fracture. Result imperfect.*

Pat. Mahoney, æt. 22. Simple fracture near the middle of the right thigh. Dr. P., of Buffalo, employed.

Nov. 1, 1852, eight weeks after the fracture had occurred, I found the fragments united, with a shortening of two inches. The limb was also much bent outwards at the seat of fracture.

CASE 56. *Simple fracture. Result imperfect.*

Francis Brodie, æt. 36. Admitted to the Buffalo Hospital, Jan. 5, 1853. Four months before admission his thigh had been broken near its middle. Dr. J. was employed as surgeon. It was treated with a straight splint. Brodie says he was visited by Dr. Jackson six times.

The limb is straight, but shortened, by overlapping, one inch.

CASE 57. *Simple fracture. Result imperfect.*

Graves Simcoe Lee, of Westminster, C. W., æt. 22, fell, in wrestling, and fractured his right femur through its middle third, June 12th, 1851. Dr. M., of Buffalo, was called, and on the following day, I was associated with him. We dressed the limb with a straight, and side splints, making extension by means of a paste gaitre and the worm screw.

The fragments were firmly united in about four weeks, and with a shortening of half an inch.

CASE 58. *Simple fracture. Result imperfect.*

Ernest Sieffert, of Buffalo, æt. 8, fractured his left femur near its middle. Dr. S., of Buffalo, treated it with a double inclined plane.

Five years after the accident occurred, I found it shortened half an inch.

CASE 59. *Simple fracture. Result imperfect.*

Isaac Smith, æt. 5. I saw this lad but once, Aug. 29, 1855. He was then lying in a canal boat. His left thigh had been broken eleven days by a fall from a horse. The fracture was simple and near the middle of the bone. It had been dressed with four short, side splints, by Dr. G., of Little Falls. Everything was now loose. The limb was shortened three-quarters of an inch, and slightly bent. The toes were everted. The fragments were so firmly united that I could not, with a moderate application of force, move them.

Assisted by Dr. Boardman, I applied a double straight splint (Hagedorne's). I could not lengthen the limb. I have never seen it since.

CASE 60. *Simple fracture. Result imperfect.*

G. W. Hayward, of Pittsburg, Pa., aged about 40 years, while intoxicated was thrown from a loaded wagon, breaking his left femur near its middle. Fracture simple and oblique. This occurred June 21, 1849, and on the same day he was carried to the Buffalo Hospital of the Sisters of Charity. We immediately applied the starch bandage to his leg and foot, and seven days later we commenced extension with the straight splint.

The usual lateral splints were applied to the thigh; starch was also used freely in the dressings about this part of the limb, so that the bandages held firmly to the limb, the splints to the bandage, board was attached. The foot was secured to the footboard and the thigh inclosed in side splints.

These dressings were continued nine weeks and four days, being daily seen by one or the other of the surgeons, and occasionally renewed.

When the splints were finally removed, Mr. Consaul noticed a "callus."

One year after, Mr. Consaul called upon me to obtain advice as to the propriety of his prosecuting his surgeons.

I found the limb shortened three-quarters of an inch, and somewhat bent outwards at the seat of fracture. The leg is occasionally painful, and not as strong as before. His knee especially "gives out" when he walks.

CASE 68. *Simple fracture. Result imperfect.*

John Laughton, æt. 7, admitted to the Buffalo Hospital, Jan. 26, 1853, with a fracture of the femur near its middle. He had fallen, January 12th, from a ladder, a height of nine feet. Dr. W., of Buffalo, dressed the limb with Gibson's splint.

I substituted for Gibson's splint, my own, and covered the foot and leg with a paste bandage, making extension with adhesive straps.

On the thirty-ninth day the union was firm, and I removed all dressings on the forty-fifth day. The limb was then shortened half an inch, but straight. The overlapping of the fragments felt like ensheathing callus.

CASE 69. *Simple, nearly transverse fracture. Result imperfect.*

In Dec., 1843, W. T., a house joiner, was employed shingling the roof of a railroad depot, when he fell and fractured the right femur about its middle. T. was about 40 years old. The fracture was nearly transverse.

Dr. W., of Buffalo, was called, and applied Sir Astley Cooper's double inclined plane, having previously covered the leg with a roller, and secured lateral splints to the thigh.

At the end of six weeks the dressings were finally removed, the fragments being united firmly.

Subsequently T. claimed damages for malpractice in the treatment of the leg, and Dr. W. was sued and the case was tried in the Erie County Supreme Court, first in 1844, and again in June, 1845. In neither of these trials were the jury able to agree. Finally, in

June, 1848, it was tried in the same court, Justice James G. Hoyt presiding. Eli Cook, for plaintiff; J. G. Masten, S. G. Haven, and James Shelden, for defence.

The limb is now shortened one inch, and considerably bent or bowed forwards at the seat of fracture. Drs. Trowbridge, Barnes, and Burwell, witnesses on the part of the prosecution, thought it a "medium cure." Dr. Sprague did not think so. Dr. Flint, on the part of the defence, thought it an average cure. I thought it nearly, but not quite, an average cure.

The plaintiff claimed that the bend and shortening resulted from the use of a double inclined plane, and from negligence in its use; and that it occurred while the limb was in the splint. The defendant replying that it came out of the splint straight, and that the deformity now present took place after his responsibility had ceased.

Dr. Trowbridge said that "more or less deformity usually follows a fracture of the thigh bone, even in the best cases."

Dr. B. Burwell said "it was a difficult bone to heal, and to make straight."

Dr. Austin Flint said "fracture of the thigh-bone is one of the most difficult to treat, perhaps the most so."

Dr. Willard Parker said, "in children you may generally get union without shortening; in a well, active man you may not; it depends upon the power of the muscles."

The cause was submitted to the jury June 30, and the Judge charged the jury, as to the points of law, stating that if they were satisfied that the defendant had exercised ordinary skill, and ordinary care, they were to find for him. He then went into a general review of the testimony; stating also that in cases like these the medical testimony should have more weight in matters of opinion than the testimony of other witnesses, as they were, it is to be supposed, better informed upon subjects of the nature here presented.

The jury conferred with each other a few minutes, and returned a verdict for the defendant.

CASE 70. *Simple fracture. Consolidation of the callus delayed. Result imperfect.*

Charles Henry Martin, æt. 8, fell and broke his left femur, Dec. 26, 1851. Dr. N. was called, and dressed the limb with Desault's splint. On the third day after the accident I was requested to visit the patient with Dr. N.

We dressed the limb carefully with side splints, and with Desault's straight splint, making all proper extension.

He was left in charge of Dr. N., and the long splint was continued six weeks, but he did not begin to walk, with crutches, until six weeks later. He used crutches about three or four weeks, and then for the first time walked by bearing his whole weight upon the limb. The father says he limped from the time he began to walk, and that there was a large "callus" about the fracture.

Six months after it was broken, and full four months after he began to walk, it was noticed that the limb was bending, and on the 22d of August, 1852, when the child was brought to me, the thigh was very much bent outwards at the seat of fracture. There was no pain or soreness at this point, and his health was good. The father says that the change in the form of the limb was such that he could notice it from week to week; that this change seemed to him to have been going on about six weeks, and that he knows no cause for it.

I advised a resort to splints, but the patient refused absolutely to have them applied. Three months from the date of this examination, the lad was brought to me again (Dec. 1, 1852). No treatment had been adopted. The boy had continued to run about as usual. The bending had ceased spontaneously, and, indeed, the bone seemed to have become a little straighter.

CASE 71. *Simple fracture. Broken twice in the same place, at different periods. Result imperfect.*

John Gordon, of Rochester, æt. 8, broke his thigh near its middle. Dr. D., of Rochester, took charge of the limb.

It was again broken when he was 14 years old at the same point. Dr. T., of Rochester, was employed. Both surgeons used the straight splint.

Sept., 1851, sixteen years after the last fracture, I found the limb shortened half an inch.

CASE 72. *Simple fracture. Union delayed. Result imperfect.*

Jacob Turinger, of Lancaster, N. Y., æt. 14, fell from a tree, breaking his left thigh near its middle.

Dr. P., of Lancaster, was employed. He applied a straight splint, with extension and counter-extension. He was unable to prevent the fragments from overlapping by any amount of extension which he could employ; and, as the sharp point of the upper fragment projected considerably, he did not, for some time, dare to apply lateral splints, and to this fact, Dr. Potter attributes the delay in union.

Eleven weeks after the fracture had occurred, Dec. 13, 1848, he was admitted to the Buffalo Hospital. The fragments were not united, and the limb was shortened three-quarters of an inch. He says they have been united imperfectly, and that the re-fracture was produced by sitting on the edge of the bed.

I applied my own straight splint, with also side splints. Fourteen days from this time, the union of the fragments was accomplished, and, as the foot had appeared swollen for some days, I removed the straight splint, and continued only the side splints.

Jan. 3, all dressings were removed, and on the 10th he was discharged with the limb straight, but shortened three-quarters of an inch.

Case 73. *Simple fracture. Consolidation of callus delayed. Bone accidentally re-fractured. Result imperfect.*

Joseph McEllicott, æt. 22, was crushed under a bank of earth, Oct. 27, 1850, breaking his right femur near its middle; also his lower jaw and both bones of his left leg. The fracture of the thigh was simple and oblique.

Dr. J., of Waverly, was employed. He applied two long splints, &c.

Jan. 28, three months after the fracture occurred, he was admitted into the Buffalo Hospital. The right thigh was united, but very much bent at the seat of fracture, and shortened three inches or more. There was an ulcer under the heel of the right foot. The whole limb was swollen. An abscess existed in the left leg, and an ulcer under the left heel. Patient was quite feeble. Before the accident, he had enjoyed excellent health, with the exception that he had, at the time of the fracture, intermittent fever.

I laid a bladder filled with water under each heel, and suspended the limbs in a swinging fracture apparatus. The legs were ordered to be bathed in cold water twice daily.

On the 13th of February, phlegmonous erysipelas attacked the left leg, which was arrested under a tonic and stimulating treatment, after several days.

On the morning of the 17th of Feb., I found the fragments again separated: they having been re-fractured by an attempt to turn in bed. On the 19th, I applied a starch bandage and straight splint to the right leg and thigh, with extension, &c. On the 24th, I noticed that the limb seemed straight. March 29th, I removed the dressings, and found the limb united; it was now nearly six weeks since it had been re-fractured, and five months since it was first broken.

After being confined in the hospital several months longer, he began to walk, and finally recovered, with a shortening in his right thigh of three inches. At no time while he was an inmate of the hospital could we extend the limb beyond this.

CASES 47 AND 75. *Simple fracture in left femur, and comminuted in right. Union delayed in latter case. Result imperfect.*

Joseph Powers, of Clyde, N. Y., æt. 23, was at work in a steam mill connected with a saw mill, when he was caught by the pump belt, and drawn over the main shaft. The belt, falling over his shoulders and neck, lashed him fast, and carried him over, it is estimated, one hundred and fifty times, the shaft making this number of revolutions in a minute. At each revolution he passed within one foot of the ground.

The left femur was broken near its middle. The right femur was broken near its middle and in its lower third. The left humerus was also broken, and the radius dislocated forwards at the elbow.

Dr. ——, of Clyde, was in attendance. The radius was reduced immediately, and the humerus dressed with suitable splints. The patient was conscious, but the muscles offered no resistance, being completely paralyzed by the injury; and by the application of only moderate force, the broken femurs were brought into exact position. The severity of the injury, however, was such as, at first, scarcely to encourage a hope that the patient would recover, and no splints or other mechanical appliances were employed upon the lower extremities during several days. They were subsequently secured to a double inclined plane, but it was now found impossible again to reduce the fragments.

Four months after the accident, I was called to see him. The left femur had then united, but it was shortened two inches, and bent forwards at the seat of fracture. The right femur had united in its lower third, but no union had occurred in its middle. I rubbed the ends violently together, and then, having secured the limb in a straight splint, with as much extension as he could bear safely, with also side splints snugly laid against the limb, I left him in charge of his surgeon.

I observed that no amount of extension would enable us for one moment to extend the limb more than half an inch, and that this could not be retained by any force which might be safely continued.

Three months later, Mr. Powers called upon me at my office, bony union having been completed within one month from the time I saw him. He was now walking without aids, and his height was two inches less than before the accident.

CASES 76 AND 77. *Simple fracture in left femur, and comminuted fracture in right. Limbs crooked soon after recovery, but eventually becoming straight.*

Hume, æt. 4, of Buffalo. Both of her thighs were broken April 8, 1847, by the passing over them of a wagon loaded with a cord of wood. The left femur was broken a little above its middle, and the right femur was broken at the same point, and also lower down, but in the middle third. Considerable swelling immediately followed the accident.

I dressed the legs with side splints, and laid them over a double inclined plane of boards, covered with a cotton mattress. During the whole treatment I experienced great difficulty in retaining the limbs in place, and when, at the end of three weeks, union had occurred, I found both thighs were bent forwards at the seat of fracture. Whether they were overlapped or not it was impossible to ascertain.

Five years from this time the seat of fracture could not be felt, and both thighs were straight or of a natural form. The straightening had occurred spontaneously.

CASE 78. *Simple fracture. Preceded by mollities ossium. Result imperfect.*

A. M. Bartholomew, of Buffalo, æt. 41; until 31 years old enjoying good health, and with no scrofulous or other constitutional taint.

Mr. B. is a coppersmith, and stands most of his time, and is accustomed to lift weights considerably. During the last ten years he has not been so well; his strength and appetite having in some measure failed. He feels especially weak after dinner. A year before the fracture he noticed that his right leg was especially weak, and that the thigh was becoming bent. In 1844, when 29 years old, a large dog ran against this thigh, breaking it instantly. Dr. Terry treated the fracture, employing a straight splint, without side splints. In seven weeks union was complete, but it was several months before he was able to use the limb much.

Nineteen months after this fracture, Bartholomew consulted me in relation to a bending of his left leg, which had been progressing three or four years. I found it much bent, weak, tender, but not painful. The right leg had not bent any since the fracture. It was shortened one inch, and it was much the best leg of the two.

CASE 79. *Simple fracture complicated with fracture of the patella in the same limb. Result imperfect.*

Wm. Palmerston, of Black Rock, Erie Co., N. Y., aged about 25 years, fell, Dec. 27, 1853, and broke his left thigh near the upper end of its middle third. The patella of the same leg was broken at the same time. Dr. L., of Black Rock, was in attendance. I saw the patient with Dr. L. on the fifth day.

For the fracture of the femur we used a single long straight splint, with adhesive plaster extension, and side splints.

The femur has united with a shortening of half an inch. (See Fractures of the Patella.)

CASE 80. *Simple, oblique fracture in a paralyzed limb. Result probably perfect, but somewhat uncertain.*

Willis Sawens, of Albion, Orleans Co., N. Y., æt. 14, broke his right femur near its middle, by a fall from a horse. Direction of fracture obliquely downwards and outwards.

When only eight months old, after a severe illness, this limb was paralyzed, and had since become gradually much emaciated. It was also two or three inches shorter than the other at the time of the fracture.

Within three or four hours after the accident, before the limb was much swollen, it was reduced by Dr. H., of Paris Centre. Very little swelling ever occurred. Two men reduced it, using, as Mr. Sawen thinks, considerable force. The fracture was dressed with a roller applied the whole length of the limb, and a side splint of about seven inches in length, made of basswood, which, having been planed sufficiently thin, was steamed and bent around the leg so as to fit accurately. Between the splint and roller was placed a wide compress. The splint was secured with strings. The limb was then laid over a double inclined plane made of pillows.

He was kept in bed three months, and the lateral splint was not removed until after four months and a half.

Case 81. *Compound fracture. Result imperfect.*

John Street, of Buffalo, æt. 18, was injured by the fall of a bar of iron upon his right thigh, breaking it near its middle. One of the fragments was pushed through the skin.

On the same day, he was admitted to the Hospital of the Sisters of Charity. I applied a Potter's straight splint, and made extension with adhesive straps, &c.

The wound in the flesh healed promptly, and the bone united in the usual time. The extension was discontinued at the end of six weeks.

He left the hospital ten weeks after admission with a shortening of the thigh of one inch and a quarter. The limb was strong, and the halt scarcely perceptible. I think the unusual shortening was due to the fact that the bone had penetrated, and, by wounding the muscles, had caused them to contract.

Case 82. *Compound fracture. Result imperfect.*

George Schaeffer, æt. 8, was admitted to the Buffalo Hospital of the Sisters of Charity, Jan. 30, 1857. On the same day, a sleigh, loaded with a cord of wood, had passed over his left thigh near its middle. Dr. Hugh B. Vandeventer, of Buffalo, was immediately in attendance, and found one fragment of the femur projecting through a wound on the outside of the thigh, and the other fragment protruding on the inner side. Dr. V. reduced the fracture and dressed the limb temporarily, and then sent him to the hospital.

I found the thigh greatly swollen, and much lacerated and bruised. In this condition, it was impossible, or, at least, quite unsafe, to make extension. The only hope of saving the limb seemed to be in giving it a careful and gentle lateral support. I dressed the wounds, therefore, with simple cerate, and enveloped the thigh in gutta percha splints, well padded, and secured in place by tapes. The whole limb was then laid upon its outside, with the knee slightly flexed, after the manner of Pott.

Gradually, large portions of skin sloughed away, and then healed. The swelling steadily subsided.

Four weeks after the fracture occurred, bony union was complete, with a shortening of one inch. Until this day, the wounds were not sufficiently healed to allow of extension. Dr. John Boardman, hospital surgeon, now applied moderate extension with a straight splint, but it proved painful and useless, and was soon discontinued.

CASE 83. *Compound fracture from a gunshot wound. Result nearly perfect.*

A. B., æt. 24. This gentleman was shot, June 7, 1855, through both thighs. The bullet, discharged at ten paces from a large duelling pistol, entered the right thigh eight inches above the knee, passing a little obliquely downwards and inwards, in front of the bone, and then entering the left thigh perhaps one inch lower down and half an inch further back, so as to strike and fracture the left femur near the upper end of its lower third. The bullet buried itself in the left thigh and has never been found. A portion of the pantaloons and drawers entered with the bullet, and were drawn out before my arrival. Rollers were applied moderately firm, and cold water dressings directed; absolute rest was also enjoined.

This plan was pursued until the eighth day after the fracture. The bullet had passed in such close proximity to the femoral artery in both thighs, that it was thought most prudent, so long as there was no muscular spasms and very little displacement, to withhold the application of splints. Indeed we were in constant apprehension that a dangerous hemorrhage would occur.

On the second day the thigh and leg of the broken limb were very much swollen; he was suffering with a dull, heavy pain in his thigh, and especially behind the knee; his sleep was disturbed; his pulse 120, and wiry.

These symptoms gradually disappeared, and on the eighth day, June 15, I applied my own straight splint, with adhesive plaster extension. At this time the swelling had greatly subsided, but there was extensive discoloration of the limb from bloody effusion. The wounds were beginning to suppurate.

Aug. 1, eight weeks after the fracture, we removed the large splint and found the bone united with the line of the limb perfect, but with an overlapping of half an inch. He remained in bed one week longer, when, the wounds having been for some time completely closed, he was permitted to get upon crutches.

He now walks without the smallest amount of halt, and the limb is in all respects as useful as before. This result, so unexpected in a case where so many complications were presented, was due in no small degree to the remarkable firmness and composure of the patient, as well as to the care and skill of Dr. W., of Niagara

Falls, and Dr. C., of New York, the first of whom was in constant attendance throughout the whole course of the treatment.

CASE 84. *Comminuted fracture. Result imperfect.*

John Rayner, a discharged Florida soldier, aged about 35 years, was lying upon his back between the rails of the Syracuse and Auburn Railroad, when the train passed over him, the fire pan striking the knee of his right leg as it was drawn up, and breaking it in two places; one fracture being through the middle, and one through the lower third of the femur.

I dressed the fracture on the same day, with side splints and Bowen's double inclined plane, called also the "navy" splint. The left thigh had been broken in Florida, and had united with a shortening of about one and a half inch. (See Case 65.)

The accident occurred in the fall of 1839, and union took place in the usual time, but with a shortening of about two inches, and the fragments remaining slightly bent forwards at the seat of fracture. This shortening and bend I found it impossible to prevent, the limb being greatly swollen for many days, and not admitting of any degree of extension.

CASE 85. *Compound comminuted fracture. Result imperfect.*

J. A. Burrows, æt. 14, fell fifty feet, striking upon his knee, and fracturing his left femur through its middle. Fracture compound and comminuted.

Dr. D., of Penfield, Monroe Co., N. Y., was employed, and laid the limb upon a double inclined plane.

He did not use the leg for more than a year. About eighteen months after it had been broken, a small piece of bone escaped through a fistulous opening. Seventeen years after the accident, while he was a student of medicine, I examined the thigh, and found it firm, but shortened one inch. The whole limb is atrophied, but he walks without scarcely any limping.

CASE 86. *Compound comminuted fracture. (Gunshot fracture.) Result imperfect.*

Pat. Haney, of Livingston Co., N. Y., æt. 23, had his thigh broken near its middle, by a bullet, while he was serving as a private soldier in the English army. He was treated by an army surgeon.

Thirty-eight years after, when I saw him in the Livingston

County Alms-House, N. Y., the thigh was shortened one inch and a quarter, but the limb was quite useful.

Lower Third.

Remote from Condyles.

CASE 87. *Simple fracture. Result perfect.*

James Bryan, of Buffalo, æt. 8, fractured his — femur, at the upper end of the lower third, Jan. 20, 1849. Fracture simple. He was admitted to the Buffalo Hospital on the next day.

Jan. 23d, we applied the starch bandage to his foot and leg.

Jan. 28th, seven days after the occurrence of the fracture, extension and counter-extension were made with a straight splint, and lateral splints were also applied.

This treatment was continued until the 17th of February, a period of twenty days, and extending to twenty-seven days after the fracture, during which time the little patient made no complaint, but was always cheerful and happy.

On the 17th of February, the bandages and splints were removed. The bone had united with proper length and direction. There was not even discoloration or tenderness about the ankle or leg.

CASE 88. *Simple transverse fracture. Result perfect.*

Aug. 13, 1847, Harris, a lad 3 years old, fell from a ladder, breaking his left thigh near the upper end of the lower third. I think the fracture was transverse. Assisted by Dr. K., of Buffalo, I dressed the limb a few hours after the accident.

We applied lateral splints, made of felt, and then laid the whole limb over a double inclined plane.

On the fifth day, I re-dressed the fracture, and found everything in place.

On the thirteenth day, the limb was bent and overlapped. Finding that the fragments had not united, I immediately substituted a simple straight splint, such as I usually employ for children, making, at the same time, as much extension as he would bear.

One year after, the limb was straight, nor was there any perceptible shortening.

CASE 89. *Simple fracture. Result imperfect.*

Abram Miller, of Steuben Co., æt. 24, fractured his right femur through its lower third. Fracture simple.

Dr. W., of Wyoming, N. Y., was employed. The limb was dressed with side splints, and laid over a double inclined plane.

Thirty years after the accident, I found the thigh shortened one inch and three-quarters; yet he walked with only a very slight halt.

CASE 90. *Simple fracture. Result imperfect.*

Elisha Standish, æt. 42, fractured his thigh through its lower third. A surgeon, in Livingston Co., N. Y., whose name he has forgotten, dressed and took charge of the limb.

Five years after the accident had occurred, I found him an inmate of the Livingston County Almshouse. His thigh was shortened one inch.

CASE 91. *Simple fracture. Result imperfect.*

H. Hogan, of New York, æt. 42, fractured his — femur through its lower third.

It was treated at Bellevue Hospital, N. Y., with a straight splint, and with adhesive plaster extension.

I examined the limb seven weeks after the fracture had occurred, and found it shortened half an inch.

CASE 92. *Simple fracture. Result imperfect.*

Henry Dugan, Buffalo, æt. 11. Fracture of right femur about three or four inches above the knee-joint. Simple. Occasioned by being tripped in wrestling, and falling with his legs spread asunder.

The limb was immediately dressed by Drs. L. and B.; and on the same or following day, Feb. 5, 1853, he was carried to the hospital. I found the limb inclosed very neatly, in long splints made of binders' board, carefully moulded to the limb and secured in place with a roller extending from the toes upwards. In order that I might examine the fracture I removed these dressings. I now dressed the limb carefully myself with first a paste bandage, extending from the toes to above the knee. I then applied lateral splints to the thigh and a long splint for extension. Extension was made with adhesive straps. Great care was taken in the dressings, and when they were completed the two limbs were of the same length. I measured with a tape line.

March 5th, I removed the splint. The fragments were united, but with a shortening of three-quarters of an inch. The upper fragment overlapping and lying upon the outside of the lower. This result has happened notwithstanding I took unusual care, throughout the treatment, to keep up the extension, and notwithstanding the patient was in every way submissive.

CASE 93. *Simple fracture. Result imperfect.*

Sarah Sullivan, æt. 27, admitted to the Buffalo Hospital, March 9, 1851, with a fracture of the right femur, near the upper end of the lower third. The limb had not been dressed.

I ordered a paste gaiter to be applied to her foot and leg, and on the 10th the house surgeon applied the long thigh splint with extension and counter-extension; also the usual lateral splints.

Union occurred in about five weeks, with a shortening of three-quarters of an inch. Mrs. Sullivan was a feeble woman, and did not bear confinement well. At several times we found she had loosened her bandages herself.

CASE 94. *Simple fracture. Result imperfect.*

Alonzo Benedict, of Buffalo, æt. 10, was run over by a wagon loaded with lumber, Sept. 24, 1852, breaking his — femur at the upper end of the lower third. I could bend the limb at the point of fracture, with great freedom, yet I could not produce crepitus. I was unable to determine at first whether it was not broken also at a point lower down. I now think it was not.

I applied my double, long splint, making extension with adhesive plasters, and confining the whole length of the limb very snugly to the long splint. At first, and for several days, I used no small side splints upon the thigh. When the dressings were applied I measured the limbs and found them of the same length.

Oct. 22, four weeks after the occurrence of the fracture, I removed the apparatus, and found the fragments united with a shortening of one-quarter of an inch. There was also a slight forward projection at the seat of fracture.

Sept. 15, 1856. He walks without any halt, and has never suffered any inconvenience from the limb.

CASE 95. *Simple fracture. Result imperfect.*

Lyttle, æt. 20. Femur broken four inches above the knee, obliquely, by the fall of a bank of earth.

Five hours after, when I dressed the fracture, it was much swollen.

I restored the fragments, as completely as possible, with pulleys, and then applied Gibson's splint; allowing the pulleys to remain for a few days.

March, 1837, three months after the accident, he was walking without any perceptible halt. The limb was, however, shortened half an inch.

CASE 96. *Simple fracture. Result imperfect.*

Feb. 28, 1846, John Burscough, aged about 25 years, a very muscular and fat butcher, was thrown from his sleigh and broke his thigh at the upper end of the lower third. Dr. M. and myself in attendance.

We placed him temporarily on a double inclined plane, having no straight splint at hand. On the following day we applied the straight splint. At the end of four weeks we loosened the extension and found an ulcer on the heel. The bones were not united. At the end of six weeks we removed all extension. The bones were then united. The ulcer did not close under a month or two. The thigh was shortened half an inch.

CASE 97. *Simple fracture. Union delayed. Result unknown.*

Pat. McDonald, of Medina, N. Y., æt. 23. His left thigh was broken in its lower third by being traversed by a hand car.

He was at first seen by Drs. W., H., and F., of Medina. A splint was applied and extension employed, but on the fourth day it became so painful that the extension was discontinued. On the eighteenth day extension and counter-extension were again employed, and continued for some time.

Feb. 18, 1853, seven weeks after the fracture occurred, he was brought to the Buffalo Hospital. The fragments were still ununited. He was pale and feeble; leg and foot much swollen; excoriations about the thigh; a sloughing ulcer soon occurred upon the heel.

I did not apply any splints until March 9, having only employed, until this time, means to re-establish his health. I then applied a paste roller and splints of binders' board. He was directed also to get up on crutches.

About one month after admission I found the bones united, and, my record says, without any shortening, but I do not know by whom the measurement and record were made.

CASE 98. *Simple fracture, complicated with a fracture of the tibia and fibula in the same leg. Result imperfect.*

Thomas Dolanty, aged about 30 years. August 14, 1854, his leg and thigh were traversed by a loaded cart, breaking the thigh near the upper end of the lower third, and the leg about eight inches above the ankle; the latter accident was compound.

Assisted by Austin Flint, Jr., I dressed both fractures carefully, applying my own long splint. Extension, so far as we were able to make it, was effected through the aid of a paste gaiter.

On the tenth day Dr. B., one of the hospital surgeons, took charge of him at my request.

At the end of eight weeks the femur was united with an overlapping of three-quarters of an inch. It was perfectly straight. The leg united with a shortening of one-quarter of an inch.

CASE 99. *Compound fracture. Result imperfect.*

G. F., of B., Canada West, fell fifty-five feet, September 5, 1855, breaking his left thigh obliquely, near the upper end of the lower third. The fracture was compound. His elbow-joint was dislocated at the same time.

Mr. F. called upon me at Buffalo, I think in March, 1856, about six months after the accident had happened. He stated to me that he was 23 years old. That the limb was treated by Dr. ———, of B., C. W.; the limb was laid over a double inclined plane, and the thigh was supported with thigh splints: no means for permanent extension were employed; the limb was kept upon the splint seven weeks; two months after it was broken, and when it had united, Dr. ——— applied extension, and the fracture was reproduced. The thigh was now enveloped in a mould of plaster of Paris; this was removed at the end of one week; in three weeks more the fragments were again firmly united.

When I examined the limb it was united, but with a shortening of three inches; the foot and leg were slightly rotated outwards; an abundant callus surrounded the fracture, and a fistulous discharge still continued from the bone. His knee was stiff and his whole leg greatly swollen. He was unable to walk or stand.

CASE 100. *Comminuted fracture. Union with shortening.* (Same as Case 75. Middle third.)

Just above Condyles.

Case 101. *Simple fracture. Result imperfect.*

James A. Manley, æt. 4, fractured the right femur about two inches above the joint.

The limb was dressed, and subsequently treated, by a surgeon living in Hubbarton, Vermont.

Twenty-six years after the accident occurred, in July, 1853, I examined the leg. The point of fracture could not be felt, yet the thigh was shortened half an inch. He walked without any halt, and he was not aware that the limb was shortened.

Case 102. *Simple fracture. Result imperfect.*

Wm. Hennen, æt. 25, was caught between a carriage and a tree, Feb. 13, 1854, breaking his left femur three and a half inches above the knee-joint. Dr. L. dressed the fracture ten hours after it occurred. He applied two long splints, one on each side of the thigh and leg, with rollers, &c. Extension was made by four men, before the splints were applied, but no extension was employed afterwards. The dressings were removed and the limb examined occasionally. The splints were continued six weeks.

June 21, 1854, Hennen called upon me. The limb was shortened one inch and a half or three-quarters; the lower end of the upper fragment lying in front and upon the outside of the lower. He walked with a halt. Motions of knee-joint free.

His object in calling upon me was to ascertain whether the limb had been properly treated, and whether it could not be broken over again.

Case 103. *Simple fracture. Union delayed. Limb shortened.*

Andrew Carr, of New York, æt. 25, fractured his right femur about three inches above the joint, and was taken to the New York Hospital.

I examined his thigh, June 30, 1852, nearly five months after the fracture had occurred. The fragments were united, and the limb was shortened three-quarters of an inch. The fracture had been treated with a straight splint.

Case 104. *Compound, comminuted fracture. Exfoliation of bone and great shortening.*

Daniel Welch, of Ireland, æt. 20, was crushed under a heavy weight, breaking and comminuting his right femur just above the knee. Subsequently several pieces of bone came out.

June 30, 1851, five years after the accident, in presence of Drs. Pupikoffer, Boardman, and Nichols, I examined the limb. Welch told us at first that the limb was shortened three inches, but on careful and repeated measurements, we found it was shortened seven inches! To compensate for all this loss in the length of the limb, he had raised the heel of his shoe one inch, and now he walked with scarcely any perceptible halt. An examination of his back, however, furnished an easy solution of this seeming paradox. His spine was very much bent to the right in the lumbar region, so that constantly the right wing of his pelvis was four inches lower than the left, and when he bore his weight upon his right leg in walking, the right wing of his pelvis was six inches lower than the left.

CASE 105. *Simple fracture complicated with injury of the popliteal vessels and nerves. Gangrene of foot.*

George Taylor Aikin, of Lockport, N. Y., æt. 7. May 18, 1854, in jumping down a bank of about three feet in height, he broke the right thigh obliquely, just above the knee-joint. Direction of the fracture obliquely downwards and backwards.

Dr. G., an accomplished surgeon, residing in Lockport, was called. The limb was not then much swollen. He applied side splints, rollers, &c., carefully, and then laid the limb over a double inclined plane (Day's). The knee was elevated about six or eight inches. Before applying the splints, suitable extension had been made, and after completing the dressings the two limbs seemed to be of the same length.

These dressings were examined and readjusted daily. On about the seventh day the lad was complaining a good deal of pain, &c. He had all along been restless and had complained, at times, of pain in his leg and foot. Dr. G. now noticed, for the first time, that his toes looked unnaturally white, and that they were cold.

Counsel was now called at the request of Dr. G., when it was determined to abandon all dressings and direct their efforts solely to saving the limb.

The result has been that slowly a considerable portion of his foot died and sloughed away, leaving only the tarsal bones. The fracture united, but with considerable overlapping and deformity.

Feb. 26, 1856, the boy was brought to me by his father. His general appearance indicated delicacy. On examining the fracture I noticed that the anterior line of the bone seemed nearly straight, only bending back slightly about three inches above the joint, and this was owing in some degree to the covering of soft parts, and in some degree, also, to the manner in which the fragments rested upon each other: the pointed superior end of the lower fragment resting snugly upon the front of the upper fragment, so that no abrupt angle existed in front. On the back of the limb, however, the lower end of the upper fragment, quite pointed, projected freely downwards and backwards into the popliteal space, so that its extreme point was only about half an inch above the line of the articulation. The limb had shortened one inch, and this enabled us to determine accurately that the lower point of fracture in the bone was one inch and a half above the articulation.

The motions of the knee-joint were pretty free. The leg was extremely wasted, and the anterior half of the foot having sloughed off, the sores had now completely healed over. He was able to walk tolerably well without either crutch or cane.

Subsequently, Dr. G. found it necessary to sue the father of the child for the amount of his services, when Mr. Aikin put in a plea of malpractice, and that consequently the services were without value.

The case was tried in the March term of the Niagara circuit for 1856, at Lockport, the Hon. Benj. F. Greene presiding.

On the part of the defence it was claimed that the death of the foot was in consequence of the bandages being too tight. They failed, however, to show that they were extraordinarily or unduly tight. While on the part of Dr. G., the prosecutor, it was shown that the death of the toes was preceded by a loss of color, and that it was not accompanied with either venous or arterial congestion. The medical gentlemen examined as witnesses, declared that this circumstance furnished the most positive evidence which could be desired, that the death of the toes was not due to the tightness of the bandages, but that its cause must be looked for in an arrest of the arterial or nervous currents supplying the limb, or in both. They believed, also, that the projection of the superior fragment into the popliteal space was sufficient to cause this arrest. They also believed that this overlapping and consequent projection could not have been prevented in this case, and that, therefore, the treatment was not responsible for this unfortunate result: indeed, they regarded the treatment as correct, and the result as a triumph of skill, in that any portion of the limb was saved; the leg and foot now remaining being far more useful than any artificial leg and foot could be.

The Hon. Judge, in a speech remarkable for its clearness and liberality, sought to impress upon the jury the value of the medical testimony. The jury returned a verdict for Dr. G., allowing the amount of his claim for services, with the costs of suit.

FEMUR.

UPPER THIRD (NECK).

No.	Age when it occurred.	Time since it occurred.	Sex.	Right or left side.	Character of the fracture.	TREATMENT.	RESULT.				
							United or not.	When united.	Amount of shortening.	Remarks.	Perfect or imperfect.
1	52 y.	3 m.	M.		Simple, probably within capsule	Straight splint 3 w., and then crutches.			1½ in		Imp.
2	77 y.	6 m.	M.	R.	Simple, within capsule	No dressings for 2 weeks, and then straight splint.	U. by lig.		3 in.	Fall on trochanter; did not shorten at first; no eversion or inversion of toes; no crepitus.	Imp.
3	78 y.	36 h.	M.		Simple	Double inclined plane at first; then straight splint.			1 in.	Fall on trochanter; eversion of toes; no crepitus.	Imp.
4	73 y.	29 d.	F.	R.	Simple, without capsule	No splint.			½ in.	Fall on trochanter; eversion; no crepitus; unable to lie down for 3 months, and unable to walk for 1 year.	Imp.
5	66 y.	1 m.	F.	R.	Simple, within capsule	Double inclined plane,			1 in.	No shortening at first; no crepitus; eversion.	Imp.
6	50 y.	5 y.	F.	R.	Simple	No treatment, except confinement to bed.			1½ in	Fall on trochanter; eversion; bed-ridden after 5 years.	Imp.
7	84 y.	8 m.	F.	L.	Simple, probably without capsule	Confinement in bed.	U. by bone		½ in.	Fall on trochanter; eversion at first; unable to walk without crutches after 8 months.	Imp.
8	65 y.	6 m.	M.	L.	Simple	Gibson's straight splint.	U.		¾ in.	Blow on groin.	Imp.
9	79 y.	1 y.	F.	L.	Simple	Double inclined plane of pillows.				Eversion; 1 yr. in bed	Imp.
10	31 y.	36 y.	M.	R.	Simple	Straight, single inclined plane, with extension.	U.		1¾ in	Fall on feet; on crutches in 10 weeks; slight halt.	Imp.
11	40 y.	14 h.	M.	L.	Simple	Straight splint.			½ in	Crepitus; eversion.	Imp.
12	51 y.	9 y.	F.	L.	Simple, probably within capsule	Double inclined plane.			1 in.	Fall on trochanter; eversion; no crepitus; no shortening at first.	Imp.
13	67 y.	1 y.	F.	R.	Simple	Flexed pos.; over pillows, &c.			1 in.	Fall on trochanter; eversion; no crepitus.	Imp.
14	39 y.	6 y.	M.	L.	Simple, probably without capsule	Straight splint.	N. U.		2 in.	Blow on trochanter; eversion.	Imp.
15	57 y.	3 y.	M.	L.	Simple, within capsule	No splints.	N. U.		1½ in	Fall on feet.	Imp.
16	51 y.	7 y.	F.	R.	Simple	No splints.			¾ in.	Not able to walk under 6 months.	Imp.
17	42 y.		M.	L.	Simple, without capsule	Straight splint, with extension 6 weeks.	U.	6 w.	½ in.	Fall on trochanter; no crepitus; eversion; death on 46th day.	Imp.
18	76 y.	2 m.	F.		Simple	Double inclined plane.				Fall on hip; died in 4 months.	Imp.
19	48 y.	5 y.	M.	L.	Simple, within capsule	Detention in bed a few days, and then walking with crutches.	U. by lig.		1½ in.	Not shortened at first; subsequently shortened and everted.	Imp.
20	84 y.	5 m.	F.	L.	Simple, without capsule	In bed 6 weeks.	U. by bone	6 w.	½ in.	Slight eversion.	Imp.
21	54 y.	8 w.	M.	R.	Simple, without capsule	Straight splint 6 w.	U. by bone	6 w.	1 in		Imp.

FEMUR.

							RESULT.				
No.	Age when it occurred.	Time since it occurred.	Sex.	Right or left side.	Character of the fracture.	TREATMENT.	United or not.	When united.	Amount of shortening	Remarks.	Perfect or imperfect.
UPPER THIRD (TOP OF TROCHANTER MAJOR).											
22	23 y.	2 m.	M.	L.	Simple					Fall on trochanter; no shortening of limb, but fragment displaced.	
UPPER THIRD (BELOW TROCHANTER MAJOR).											
23	27 y.	6 w.	M.	R.	Simple	My own straight splint.	U.	3 w.	¾ in.	In all other respects perfect.	Imp.
24	7 y.	4 w.	F.		Simple	Author's straight splint 4 weeks.	U.	4 w.	¼ in.	Nearly perfect.	Imp.
25	30 y.	1 y.	M	R.	Simple	Gibson's straight splint 2 weeks, then double inclined plane, &c.	U.	10 w.	¾ in	Ulceration on instep.	Imp.
26		2 y.	M.	R.	Simple	Double inclined plane.	U.		1½ in.		Imp.
27	42 y.	4 y.	M.		Simple		U.		¾ in.	Slightly bent.	Imp
28	9 y.	31 y.	M.	R.	Simple		U.		1½ in.	Limps very little	Imp.
29	55 y.	6 w.	M.		Simple	Straight splint.	U.	6 w.	¾ in.	Broken at seat of an old fracture.	Imp.
30	49 y.	7 w.	M.		Simple	Double inclined plane.	U.		½ in.		Imp.
31	1 y.	1 y.	M.	R	Simple	Lateral splints.	U.		none	Slight bend at point of fracture, and slight inversion of toes.	P.
32	40 y.		M.	R.	Simple	Straight splint 18 d., and double inclined plane, 16 days.	U.	5 w.	½ in.		Imp.
33	13 y.	10 w.	M.	L.	Simple	Potter's straight splint.	U.		1 in.		Imp.
34	5 y.	8 w.	M.	L.	Simple	Straight splint.	U.	4 w.	¾ in.	No halt.	Imp.
35	55 y.	2 m.	F.		Simple	Welch's splint as a double inclined plane 1 week, and then as a straight splint.	U.		½ in.		Imp.
36	47 y.	2 y.	F.	L.	Simple	Various.	U.		1 in.	Bent forwards at seat of fracture.	
37	29 y.		M.		Simple	Straight splint.	U.	52 d.	¾ in.	A re-fracture; slough on heel.	Imp.
38	16 y.	12 y.	M.	L.	Simple		U.		3⅞ in.	Fractured three times at same point.	Imp.
39	14 y.		M.	L.	Complicated	Day's double inclined plane.	N. U.		¾ in.	Death in 4 weeks.	Imp.
MIDDLE THIRD.											
40	9 y.	3 m.	M.	L.	Simple	Straight splint.	U.	4 w.	none		P.
41	13 y.	1 m	M.		Simple	Straight splint.	U.	3 w.	none		P.
42	9 y.	1 y.	M.	R.	Simple		U.		none	Slightly bent forwards and outwards.	P.
43	3 y.	63 y.	M.		Simple		U.		none		P.
44	15 y.	30 y.	M.		Simple		U.		none		P.
45	3 y.	1 y.	M.		Simple	Pillows.	U.		none		P.
46	5 y.	2 y.	M.	R.	Simple	Straight splint.	U.				
47	8 y.	6 w.	F.	R.	Simple	Straight splint.	U.	4 w.	½ in.		Imp.
48	19 y.	1 y.	M.	L.	Simple	J. F. Flagg's straight splint.	U.	5 w.	½ in.	Bent outwards at seat of fracture.	Imp.
49	9 y.	46 d.	M.	R.	Simple	Gibson's splint.	U.	46 d.	¼ in.		Imp.
50	18 y.	1 m.	M.	L.	Simple	Straight splint.	U.	23 d.	¾ in.		Imp.
51	10 y.	2 m.	M.		Simple	Hamilton's straight splint.	U.	1 m.	½ in.		Imp.
52	12 y.	5 w.	M.	L.	Simple	Hamilton's straight splint.	U.	5 w.	½ in.		Imp.
53	11 y.	11 w.	M.	R	Simple	Straight splint.	U.		½ in.		Imp.

FEMUR.

MIDDLE THIRD—*Continued.*

No.	Age when it occurred.	Time since it occurred.	Sex.	Right or left side.	Character of the fracture.	TREATMENT.	RESULT.				
							United or not.	When united.	Amount of shortening.	Remarks.	Perfect or imperfect.
54	6 y.		M.	R.	Simple	Gibson's and then Hamilton's straight splint.	U.	1 m.	¼ in.	Slightly bent forwards and outwards.	Imp.
55	22 y.	2 m.	M.	R.	Simple		U.		2 in.	Much bent outwards at seat of fracture.	Imp.
56	36 y.	4 m.	M.		Simple	Straight splint.	U.		1 in.		Imp.
57	22 y.	2 m.	M.	R.	Simple	Flagg's straight splint.	U.	2 m.	½ in.		Imp.
58	8 y.	5 y.	M.	L.	Simple	Double inclined plane.	U.		½ in.		Imp.
59	5 y.	11 d.	M.	L.	Simple	Side splint only.	U.	11 d.	¾ in.		Imp.
60	40 y.	2 m.	M	L.	Simple	Straight splint.	U.	3 w.	¼ in.		Imp.
61	22 y.	9 w.	M.	R.	Simple	Straight splint.	U.		¾ in.		Imp.
62	13 y.	13 y.	M.		Simple		U.		1¼ in.	No halt; spine crooked.	Imp.
63	15 y.	19 y.	M.	L.	Simple		U.		¼ in.		Imp.
64	16 y.	25 y.	M.	L.	Simple		U.		¾ in.	No halt.	Imp.
65	30 y.	5 y.	M.	L.	Simple		U.		1½ in.		Imp.
66	25 y.	17 w.	M.	L.	Simple	Straight splint.	U.		¾ in.	Upper fragment on inside of lower.	Imp.
67	30 y.	1 y.	M.	L.	Simple	Double inclined plane.	U.		¾ in.	Some bent outwards at seat of fracture.	Imp.
68	7 y.	6 w.	M.		Simple	Gibson's straight splint 2 weeks, and then Hamilton's.	U.	30 d.	¼ in.		Imp.
69	40 y.	4 y.	M.	R.	Simple	Double inclined plane.	U.	6 w.	1 in.	Bent forwards at seat of fracture.	Imp.
70	8 y.	1 y.	M.	L.	Simple	Desault's straight splint	U.			Bending of limb from non-consolidation of callus; bent outwards.	Imp.
71	8 y. 14 y.	22 y. 16 y.	M.		Simple	Straight splint.	U.		¼ in.	Broken twice at same point.	Imp.
72	14 y.	15 w.	M.	L.	Simple	Straight splint; after 11 weeks, Hamilton's splint.	D. U.	13 w.	¾ in.		Imp.
73	22 y.	1 y.	M.	R.	Simple		U.		3 in.	Re-fractured after four mos., and reunion after 40 days more.	Imp.
74	23 y.	7 m.	M.	L.	Simple	Double inclined plane.	U.		2 in.	Bent forwards at seat of fracture.	Imp
75	23 y.	7 m.	M.	R.	Comminuted	First double inclined plane; straight splint after 5 w'ks.	D. U.	5 m.	2 in.	Same case as 74.	Imp.
76	4 y.	5 y.	F.	L.	Simple	Double inclined plane.	U.			At first bent forwards, and subsequently becoming straight.	Imp.
77	4 y.	5 y.	F.	R.	Comminuted	Double inclined plane.	U.			Same case as 76.	Imp.
78	28 y.	12 y.	M.	R.	Simple	Straight splint.	U.	7 w.	1 in.	Mollities ossium; both legs bent.	Imp.
79	25 y.	2 m.	M.	L.	Complicated	Straight splint.	U.		½ in.		Imp
80	14 y	8 y.	M.	R.	Simple	Side splints and flexed positions.	U.			Paralytic limb; exact result unknown.	
81	18 y.	10 w.	M.	R.	Compound	Potter's straight splint.	U.		1¼ in.		Imp.
82	8 y.	2 m.	M.	L.	Compound	Pott's method.	U.	2 m.	1 in.		Imp.
83	24 y.	2 m.	M.	L.	Compound	My own splint.	U.		½ in.	Gunshot fracture.	Imp.
84	35 y.	2 m.	M.	R.	Comminuted	Double inclined plane.	U.		2 in.	Bent forwards at seat of fracture.	Imp.
85	14 y.	17 y.	M.	L.	Com'und comminuted	Double inclined plane.	U.		1 in.	Atrophy of limb; slight halt.	Imp.
86	23 y.	38 y.	M.		Com'und comminuted		U.		1½ in.	Gunshot fracture.	Imp.

FEMUR.

LOWER THIRD (REMOTE FROM CONDYLES).

No.	Age when it occurred.	Time since it occurred.	Sex.	Right or left side.	Character of the fracture.	TREATMENT.	RESULT.				
							United or not.	When united.	Amount of shortening.	Remarks.	Perfect or imperfect.
87	8 y.	2 m.	M.		Simple	Hamilton's straight splint, &c.	U.	1 m.	none		P.
88	3 y.	1 y.	M.	L.	Simple	Double inclined plane 13 days, then Hamilton's straight splint.	U.		none	On the 13th day the limb was shortened, before the straight splint was applied.	P.
89	24 y.	30 y.	M.	R.	Simple	Double inclined plane.	U.		1¾ in.	Slight halt.	Imp.
90	12 y.	5 y.	M.		Simple		U.		1 in		Imp.
91	12 y.	7 w.	M.		Simple	Straight splint.	U.		¼ in.		Imp.
92	11 y.	1 m.	M.	R.	Simple	Straight splint.	U.	1 m.	¾ in.	The upper fragment on outside of lower.	Imp.
93	27 y.	2 m.	F.	R.	Simple	Straight splint.	U.	5 w.	¾ in.		Imp.
94	10 y.	4 y.	M.		Simple	My own double, straight splint.	U.	1 m.	¼ in.	Slight forward projection at seat of fracture, at end of 1 mo.	Imp.
95	20 y.	3 m.	M		Simple	Gibson's straight splint.	U.		½ in.		Imp.
96	25 y.	6 w.	M.		Simple	Straight splint.	U.	6 w.	¼ in.	Ulcer on heel.	Imp.
97	23 y.	11 w.	M.	L.	Simple		D. U.	11 w.		Ulcer on heel.	Imp.
98	30 y.	2 m.	M.		Complicated	My own straight splint.	U.		¼ in.		Imp.
99	23 y.	6 m.	M.	L.	Compound	Double inclined plane and plaster of Paris mould.	U.		3 in.	Refractured at end of 2 mos , and reunited in 3 w'ks ; toes everted ; fistula ; unable to walk after 6 months.	Imp.
100	23 y.	7 m.	M.	R.	Comminuted	See Case 75.	U.		2 in.	See Case 75.	Imp.

LOWER THIRD (JUST ABOVE CONDYLES).

No.	Age when it occurred.	Time since it occurred.	Sex.	Right or left side.	Character of the fracture.	TREATMENT.	United or not.	When united.	Amount of shortening.	Remarks.	Perfect or imperfect.
101	4 y.	26 y.	M.	R.	Simple		U.		¼ in.		Imp.
102	25 y.	16 m.	M.	L.	Simple	Long side splints, without permanent extension.	U.		1¼ in.	Upper frag. in front and outside of lower	Imp.
103	25 y.	5 m.	M.	R.	Simple	Straight splint.	D. U.		¾ in.	Not united after 5 mos.	Imp.
104	20 y.	5 y.	M.	R.	Com'und comminuted		U.		7 in.	Portions of bone lost by exfoliation.	Imp
105	7 y.	2 y.	M.	R.	Complicated	Double inclined plane.	U.		1 in.	Sloughing of part of foot.	Imp.

ANALYSIS.

Of 105 fractures of the femur, 39 occurred in the upper third, 46 in the middle third, and 19 in the lower third; or if we confine our estimates to the shaft alone, 17 belong to the upper third, 46 to the middle, and 19 to the lower.

The femur constitutes, therefore, a striking exception to the rule which my other observations have established, that in the case of the long bones the lower third is most often the seat of fracture. The femur is most often broken in its middle third.

Of the fractures belonging to the upper third, 21 were fractures of the neck, one was a fracture of the top of the trochanter major, and 17 occurred below the trochanter minor. All were uncomplicated with external wounds.

Neck.

Of the fractures of the neck, 6 are supposed to have been within the capsule, 6 to have been without, and 9 are undetermined.

The youngest person having a fracture declared to be within the capsule, was 48 years old, and the oldest 77, the average of their ages being 58½ years; 4 were males and 2 females; 2 are believed to have been produced by falls upon the trochanter major, and one by a fall upon the feet. In 3 cases, the toes were everted, in 1 case neither eversion nor inversion occurred, and in the remainder no mention is made of this circumstance. In 4 cases no crepitus could be detected. In 4 cases, also, the limb was not shortened at first. All of these patients recovered, but with a shortening of the limb varying from one to three inches, and averaging one inch and seven-twelfths, or a fraction over one inch and a half.

The youngest person having a fracture of the neck of the femur, declared to have been without the capsule was 39 years old, and the two oldest were each 84 years. The average of their ages was 62 years; 3 were males and 3 females; 4 are believed to have been produced by falls or blows upon the trochanter major. In 5 cases eversion of the toes and foot was observed. The absence of crepitus is mentioned twice. All recovered with a bony union of the fragments, but Case 17 died on the forty-sixth day, from causes independent of the fracture, and after bony union had occurred. The shortening varied from half an inch to two inches, the average being eleven-twelfths of an inch.

Résumé of all the Fractures of the Neck of the Femur.

An analysis of all of the 21 cases of fracture of the neck of the femur presents the following results: The youngest person was 39 years old, the oldest 84. Average of age, 60 years; 11 males, 10 females; 8 occurred in the right thigh, and 10 in the left. All were simple; 6 were believed to be without the capsule, 6 were believed to be within, and the remainder were undetermined. Eversion was present, either immediately or soon after the accident occurred, in 13 cases. In one case the toes were neither turned in nor out.

Crepitus was observed in 1 instance, and the absence of crepitus is noticed in 7.

Only one patient died in consequence of the fracture (Case 18); and this person not until after four months. (It will not be forgotten that inasmuch as the object of my report is to exhibit the results of treatment peculiar to fractures, I am compelled still to omit in my record all cases which terminate fatally immediately, or within a short period after the occurrence of the accident; and especially because in a majority of such cases the patients have died from other complications, and from causes wholly or mainly independent of the fracture. Accordingly, in my enumeration of fractures of the neck of the femur, I have omitted one case which terminated fatally after a few hours.)

In 5 cases the shortening was only half an inch; in 2 it was three-quarters of an inch; in 5 it was one inch; in 4 one inch and a half; in 1 one inch and three-quarters; in 1 two inches; in 1 three inches; and in 2 cases the exact amount of shortening was not determined; in no case, however, did the patient recover without some shortening. The average shortening was one inch and one-seventh. In Cases 2, 5, 12 and 19 there was no shortening at the time of the first examination, yet in the first of these cases the shortening finally reached the extreme limit of three inches.

In Case 1 the patient was on crutches within three weeks; in Case 8 within one month; in Cases 14 and 20 within six weeks; in Cases 17 and 21 in seven weeks; in Cases 2 and 3 within two months; in Cases 10 and 12 within ten weeks; in Case 13 within three months; in Case 16 within six months; in Case 7 within eight months; in Cases 4 and 9 within one year. Case 6 was bedridden at the end of five years. Exclusive of this last case, and of the patient who died at the end of four months, the average period of confinement to bed was four months and two days.

Shaft.

One case, among the fractures of the upper third, is recorded as a fracture of the top of the trochanter major; whether this was complicated with any further lesion of the bone in this vicinity, it is perhaps impossible to say positively. The fragment remained slightly drawn up from the body of the trochanter.

The remaining cases of fracture of the upper third of the femur, 17 in number, occurred below the trochanter minor. Of these, all except Case 89, which terminated fatally in four weeks, were simple, unless we except also Cases 29, 37 and 38, which were re-fractures; and most of them were believed to have been oblique.

Case 31, occurring in a child one year old, united without any shortening. All of the remainder were shortened. Thus, 1 was shortened one-quarter of an inch; 3 half an inch; 7 three-quarters of an inch; 2 one inch; 2 one inch and a half; and Case 38, which had been broken three times at the same point, finally became shortened three inches and seven-eighths. The average shortening, exclusive of this latter, was four-fifths of an inch.

It is remarked in four cases that there remains at the seat of fracture more or less bending. In Cases 31 and 36, the angle was salient forwards; in Case 23 it was salient outwards and only slightly forwards.

In eight cases, the straight splint, with extension and counter-extension, was employed throughout the treatment, or in so much as to be responsible for the result; in three cases, the double inclined plane; in two cases, both were employed at different periods of the treatment; in the remainder, the plan of treatment is not mentioned, except that in Case 31 only lateral splints were employed. I believe, also, that in all of the cases lateral splints were used. The average shortening in those treated by the straight splint, with extension and counter-extension, is two-quarters and five-seventeenths of an inch, and by those treated alone by the double inclined plane, it is three-quarters and two-elevenths of an inch. In no case where the straight splint was used did the shortening exceed one inch, while in one case where the double inclined plane was used it reached one inch and a half. As to the bending occasionally noticed at the seat of fracture, the observations are not sufficiently numerous to establish any rule; yet it is proper to remark that where the straight splint had been employed such a deviation has been recorded but once, and then it was slight, and that the deviation was outwards rather than forwards.

Of the forty-six fractures of the middle third, thirty-seven were simple, the remaining nine being complicated by either a wound communicating with the fracture, or by being broken more than once, or by other graver accidents. Indeed, two of the fractures marked simple were accompanied with a fracture of the opposite femur; one was rebroken after it had united, one was in a paralytic limb, and one was complicated with a mollities ossium of both femurs. Rejecting these cases also from the present enumeration, there remain, strictly speaking, but thirty-three simple fractures.

Let us determine the results of treatment first in these cases.

In six cases, the ages of the patients ranging from three years to fifteen, and averaging eight years and a half, there was no shortening. In Case 46, the result is not ascertained, and in Case 70, although a shortening is known to have existed, yet its precise amount is not determined. In the remaining twenty-four cases, the ages of the patients ranging from five years to forty, and averaging eighteen years, there was found always more or less shortening, the amount of shortening ranging from one-quarter of an inch to two inches, and averaging half an inch and twenty-three ninety-sixths, or a small fraction less than three-quarters of an inch.

In reference to the general plan of treatment adopted in these simple fractures of the middle third, having only regard to the position of the limb, I find that of the 6 recorded as not shortened, 2 are known to have been treated with straight splints, with extension and counter-extension, and 1, a child of three years, was treated by laying the limb over a double inclined plane made of pillows, and without extension. The treatment in the cases of the remaining 3 is not recorded.

In the 24 cases declared to be shortened, 1 was treated with side splints only, in 5 cases the plan of treatment is not known, and of the remaining 18, 15 were treated by straight splints, with extension, &c., and 3 by the double inclined plane. The shortening ranging in the first class of cases from one-quarter of an inch to one inch, and averaging half an inch and one-twelfth, or a fraction over half an inch; and in the second class of cases ranging from half an inch to one inch, and averaging just three-quarters of an inch.

In speaking of the bending of the limbs noticed after union, or of the direction of the displacements of the fragments, my observations are so few as to render them valueless unless I include in the enumeration both the simple and complicated fractures.

This circumstance has been noticed in some degree in 11 cases of the 46 belonging to the middle third of the femur. In 1 case the direction of the deviation is not mentioned. In 4 cases it is said to have been forwards—that is, the angle was salient forwards at the seat of fracture: in 4 it was outwards, and in 2 it was forwards and outwards. As to the direction of the overlapping, I regret that my records furnish me only one accurate statement, and in this case the upper fragment was found lying upon the inside of the lower, a circumstance which probably has found a place in my notes only because of its unusual character.

In 2 of the cases where a bend at the point of fracture has been distinctly noticed, the plan of treatment was not known. In 4 cases the straight splint was employed, and in 5 the double inclined plane. But to render the comparison more fair, as illustrating the value of treatment, we must reject from the first class of cases one in which the bending took place subsequent to the removal of the splint from non-consolidation, or perhaps softening of the callus, and one in which both thigh-bones were affected with mollities ossium; and from the second class of cases, also, one in which it was claimed that the bending occurred subsequent to the removal of the apparatus. The cases will then stand 2 to 4. There is another element, however, in this calculation which has been omitted. The flexed position was known to have been employed in only twelve cases, while the straight position was employed in twenty-four cases. Thus, as a result following the use of the straight splint, a bending has been observed in only 1 case out of every 12, while it has been noticed after the employment of the flexed position in the ratio of 4 cases out of every 12, or one in every third case.

18 fractures have occurred through the lower third of the femur, of which 13 were remote from the condyles, and 5 at or near the base of the condyles. Of the whole number, 13 were simple, and 5 more or less complicated.

2 cases recovered without any shortening. These were children, whose ages were respectively three and eight years. In Case 97, I am not certain whether the limb was shortened or not. The ages of the remaining 10, ranged from four years to forty-two, averaging twenty-three years. The shortening ranged from one-quarter of an inch to one inch and three-quarters, averaging three-quarters and five-tenths of an inch.

The double inclined plane was known to have been employed in only 1 case, 89, and in this case the shortening was one inch and three-quarters. In Case 102, long side splints were used, but no permanent extension. The shortening was one inch and a half. In 6 of the remaining 8 cases the straight splint was known to have been used, with extension, &c., and in no instance did the shortening exceed three-quarters of an inch. The average shortening was half an inch and one-sixth.

Résumé of all the fractures of the shaft of the femur: i. e., *of all the fractures which I have recorded as occurring below the neck and the trochanter major.*

The total number was 83, of which 59 were simple, and 24 complicated, either by having been previously broken at the same point, by comminution, by an external wound communicating with the point of fracture, by a fracture of the opposite thigh, or by other complications, more or less grave. The ages of the patients ranged from 1 year to 55, and averaged 17 years. 76 were males, and 7 females. 31 are recorded as having occurred in the right femur, and 29 in the left. Case 39 died in four weeks, and before union had occurred. In Case 72, of simple fracture, union did not occur until the thirteenth week, and in Case 75, of comminuted fracture, union was delayed five months; in all of the other cases bony union occurred within the usual time. The shortest period at which bony union took place was at eleven days, in a child five years old (Case 59). In 4 cases, 2 of which were adults, bony union had occurred at the end of about three weeks; in 9 cases, all of which were under fifteen years of age, bony union had occurred at the end of one month.

In the 15 cases of persons 15 years of age, or under, where the period at which the union seemed to be firm has been noticed, the average was twenty-eight days and a fraction over. In the 9 cases of persons whose ages exceeded fifteen years, and reached thirty, including Case 75, where union was delayed five months, the average period was sixty days and a fraction over: or, if we reject Case 75, the average period was fifty days and a fraction over. In the 4 cases whose ages exceeded thirty years, and reached fifty-five, the average period was thirty-five days. (This last estimate, based upon so few cases, and including one case of very extraordinary rapid union, is not supposed to possess any value, yet I have concluded to retain it for the purpose of completing the analysis.)

The average shortening in 56 simple cases, in which the exact result is recorded, rejecting all of those which presented any form of serious complications, is half an inch and $\frac{23}{224}$, or half an inch and a fraction less than one-tenth.

The average shortening in 47 simple cases, in which the exact result is recorded, rejecting not only all of those in which any form of serious complication existed, but also all of those which resulted in no shortening, is three-quarters of an inch and $\frac{1}{47}$.

In 32 simple cases, in which the straight splint, with extension, &c., was used, the average shortening was half an inch and $\frac{1}{33}$, and in the 7 simple fractures, in which the double inclined plane is known to have been used, the average shortening is three-quarters of an inch and $\frac{1}{8}$, or including in the estimate all of the fractures of the femur, both simple and complicated, known to have been treated by the straight splint mainly, the average shortening is half an inch and $\frac{1}{6}$, or a fraction less than three-quarters of an inch; while in all the fractures known to have been treated mainly by the double inclined plane, the average shortening is one inch and a quarter.

With the exception of Case 104, in which a shortening of seven inches resulted, in consequence of exfoliation of the bone, the greatest shortening occurred in cases 73 and 99, each of which was shortened three inches. In the first of these cases I only know that "long side splints" were used during the first three months, whether with or without extension, I cannot say. In the second, the double inclined plane, and subsequently plaster of Paris, as a side splint, were employed.

REMARKS.

Whatever may have been the general opinion of experienced surgeons as to the question of shortening in other fractures, very few certainly have ever claimed that in fractures of the femur a complete restoration of the bone to its original length was generally to be expected. There seems, however, to have existed only certain vague and indefinite notions as to the proportion and amount of this shortening, and which have had for their basis nothing better than a few imperfectly analyzed observations.

Says Scultetus (quoting first from Hippocrates): "For the bones of the thigh, though you do draw them out by force of extension, cannot be held so by any hands; but when the first intension slacks, they will run together again; for here the thick and strong flesh are above binding, and binding cannot keep them down. *Hippocrates de fract.* Which Celsus seems to confirm, *Lib.* 8, *cap.* 10, where he writes as follows of the cure of legs and thighs: 'For we must not be ignorant that if the thigh be broken, that it will be made shorter, because it never returns to its former state.' And Avicenna, *Lib.* 4, *Fen.* 5, saith 'that it is a rare thing for the thigh once broken, to be perfectly cured again.'

"These words admonish us," continues Scultetus, "that we should never promise a perfect cure of the thigh; but rather, using all diligence, we should foretell that it is doubtful that the patient will be always lame; but when this shall happen from the nature of the fracture, or which most frequently falls out, from the impatience of the sick person, it may be imputed to our mistake; and instead of a reward, bring us a disgrace."[1]

Says Chelius: "Fracture of the thigh-bone is always a severe accident, as the broken ends are retained in proper contact with great difficulty. The cure takes place most commonly with deformity and shortening of the limb, especially in oblique fractures, and those which occur in the upper and lower third of the thigh-bone. Compound fractures are so much more difficult to treat."[2]

Maclise, while commenting somewhat indefinitely upon certain plans of treatment, takes occasion to say: "Out of every six fractures of either clavicle or thigh-bone, I believe that as the result of our treatment by the present forms of mechanical contrivances, there would not be found three cases of coaptation of the broken ends of the bone so complete as to do credit to the surgeon."[3]

Says John Bell: "The machine is not yet invented by which a fractured thigh-bone can be perfectly secured." And Benjamin Bell declares that "an effectual method of securing oblique fractures in the bones of the extremities, and especially of the thigh-bone, is perhaps one of the greatest desiderata in modern surgery." "In all ages," he adds, "the difficulty of this has been confessedly great; and frequent lameness produced by shortened limbs arising from this cause, evidently shows that we are still deficient in this branch of practice."[4]

Colles observes, that "although three or four methods of treatment are practised, the pieces at the conclusion are often found overlapped."[5] One reason for which, in his opinion, is a too blind adherence to the principles recommended by Pott.

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[1] The Chirurgeon's Store-House: by Johannes Scultetus, a famous Physician, and Chirurgeon of Ulme in Suevia. London, 1674.

[2] System of Surgery, by J. M. Chelius, translated, &c., by South. First Amer. ed., vol. i. p. 627, 1847. See also p. 625, paragraph 679.

[3] Surgical Anatomy, by Joseph Maclise, Surgeon. First American ed. Part I. p. 36. 1851.

[4] System of Surgery, by Benjamin Bell, vol. vii. p. 21. Edinburgh, 1801.

[5] Lectures on the Theory and Practice of Surgery, by Abraham Colles. (Dublin.) P. 321. Philadelphia ed., 1845.

Velpeau says, that "after fractures of the femur, there is no limping unless the shortening exceeds three-quarters of an inch; and the same is true if the shortening occurs in the tibia. The reason is, that the pelvis inclines towards the shorter limb, and thus compensates for the deficiency in length. In speaking of the various contrivances for dressing the fractured femur, he remarks that most of them fail to obviate the shortening, and produce eschars, anchylosis, or troublesome arrests of the circulation. This is the price that is usually paid for the employment of these complicated machines, and a shortening of a quarter to three-quarters of an inch is not avoided after all. The simplest apparatus that will maintain the adjustment of the fractured femur, so that union may take place with shortening of only half an inch, is the best."[1]

Nélaton holds the following language:—

"A fracture of the body of the femur, with an adult, is always a grave accident, inasmuch as it demands so long a confinement to the bed, and especially on account of the shortening of the limb, which it is almost impossible wholly to prevent: accordingly, Boyer recommends to the surgeon, from the first day, to announce to the parents of the patient, the possibility of this accident. With infants, on the contrary, it is almost always easy to avoid the shortening."[2]

While Malgaigne declares his opinion on this subject thus, at length:—

"When we do not succeed in drawing back the displaced fragments, end to end, so that they may oppose themselves to the action of the muscles, it is impossible to preserve to the member its normal length, whatever may be the appareil or method employed. Surgeons are not sufficiently agreed upon that question.

"Hippocrates gives us to understand, that we can always correct the shortening; Celsus, falling into the opposite error, declared, that a broken thigh always remains shorter than the other. At a period quite recent, Desault pretended to cure all fractures without shortening, and his journal contains several examples. In imitation of Desault, various practitioners have modified, corrected, and improved the apparatus for permanent extension, and they claim to have themselves obtained as complete success. I ought then to declare here, in the most positive manner, that I have never obtained like results, either in the use of my own apparatus, or with that of others, nor indeed where, in pursuance of my invitation, several inventors have applied their apparatus in my wards. I have examined, more than once, persons declared cured without shortening, and yet, upon measurement, the shortening was always manifest. The misfortune of all those who believe that they have obtained those miraculous cures, is that they have not even thought of instituting a comparative measurement of the two limbs; I will say, even more, that they are most generally ignorant of the conditions of a good and faithful measurement. Sometimes, also, they have been deceived in another way; in falling upon fractures which were not displaced, especially with young persons, and they have believed that they have cured with their apparatus a shortening which had never existed. In short, when the fragments are not displaced, or even when they are brought again into a contact maintained by their reciprocal denticulations, it is easy to cure the fracture of the femur without shortening; aside of those two conditions, the thing is simply impossible.

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[1] Peninsular Journ. of Med., vol. iii. p. 384; also Memphis Med. Journ., vol. iv. p. 254 (1856).

[2] Elémens de Pathologie Chirurgicale, par A. Nélaton, tom. prem., p. 752. Paris, 1844.

"Several distinguished surgeons of our day have acknowledged this impossibility, and have renounced, in consequence, permanent extension. They allege, moreover, that an overriding of even three centimetres is of little importance, and occasions no limping. I cannot agree with this opinion. I have seen persons walk very well with a shortening of one centimetre; beyond this limit, either they limp, or they have lifted the heel of the shoe, or, in short, the limping is only concealed by a lateral deviation of the spine.[1] We thus are made to comprehend how a fracture with overlapping is always serious, and how cautious we ought to be in our prognosis."[2]

That the foregoing remarks are intended by the author to be equally applicable to other fractures of the shaft of the femur, than to those of the middle third, is made evident by what he has said before, when speaking of fractures of the upper third.

"The prognosis is sufficiently favorable when the fragments are denticulated (engrenées); when they ride, on the contrary, we must look for a shortening as almost inevitable." P. 718.

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[1] Dr. Buck, of New York, thinks that with a shortening of one inch, or even of one inch and a half, the patient may have "a useful limb, with little or no halting in his gait." N. Y. Journ. of Med., vol. xvi. p. 294.

[2] Traité des Fractures et des Luxations, par J. F. Malgaigne, tom. prem. pp. 723–4. Paris, 1847.

In our own country several of the most distinguished surgeons have testified to the constant difficulty, if not impossibility, of curing fractures of this bone without a shortening. In a suit instituted against a surgeon of New York city, for alleged malpractice, in the treatment of an oblique, comminuted, and otherwise complicated fracture of the femur near its condyles, "Dr. Mott testified that more or less shortening of the limb is uniformly the result after fractured thigh, even in the most favorable circumstances."[1]

In a very interesting communication made to the author of this report, by Jonathan Knight, of New Haven, late President of this Association, occurs the following passage:—

"I have seen but few fractures of the femur in the adult, unless of the most simple kind, in which there was not some remaining deformity; often slight, so as not to impair the usefulness of the limb, and in others considerable, and apparently unavoidable." Dr. Knight adds, however, "In the greater proportion of the fractures in children, the recovery has been so nearly perfect that no marked deformity or lameness has followed."

Says Dr. Gibson: "Had the surgeon no other difficulties to encounter, than such as present themselves after simple transverse fracture of the shaft of the thigh bone, he would have little reason to complain of the defectiveness of art, or of the power of nature in promoting a cure. So different, however, from this is the result of an oblique fracture of the body of the bone, or of a transverse fracture of its neck, that it is hardly possible in any case to calculate with certainty upon reunion without more or less shortening and deformity of the limb."[2]

Dr. Detmold, in his remarks made before the New York Academy of Medicine, at its meeting in March, 1855, declared his belief that a shortening of the femur always occurs after fracture, and that "but one inch of shortening in an average of twenty cases is a good result."[3]

Dr. J. Mason Warren, of Boston, writes to me as follows: "As you are making observations on fractures, I would state that, after a long and very careful observation, I have never yet seen, either in Boston or elsewhere, an oblique fracture of the thigh, in a patient over seventeen years of age, in which there was not some shortening. I have had cases shown to me, in which it was averred that the limb was not shortened, but on measuring myself I have found the fact otherwise. In children, I believe that union without shortening may be accomplished."

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[1] Boston Med. and Surg. Journ., vol. xxxiv. p. 450. See also Opinions of Drs. Reese, Post, Parker, Cheeseman, Wood, &c., in relation to the prognosis in this particular case.

[2] Institutes and Practice of Surgery, by Wm. Gibson. 6th ed., vol. i. p. 297. Philadelphia, 1841.

[3] New York Journ. of Med. Second series, vol. xvi. p. 261.

The following remarks, found in a very valuable paper, communicated by Frederick Lente, House Surgeon to the New York Hospital, to the Sept. No., 1851, of the *New York Journal of Medicine*, are so pertinent, that I shall make no apology for their length.

"In speaking of shortening in fractures of the thigh, I am aware that it is treading on somewhat delicate ground; for it is quite common for surgeons in private practice, and for surgeons of some eminence, too, and even for surgeons attached to some hospitals, to say that, as a general result, they get union of the femur *without any shortening;* and to accuse those who have taken the trouble to ascertain the amount of shortening in their cases, and who have had the candor to admit it, of carelessness or want of skill.

"From the opportunity I have enjoyed of examining numerous cases of this fracture, and in conversing with surgeons attached to this and other hospitals on the subject, I am prepared to coincide entirely with the opinion of Malgaigne, who says, in his *Traité des Fractures*, so often referred to in this paper, 'The misfortune of those who have thought that they have obtained these perfect cures, is, that they have not even thought of measuring the comparative length of the two limbs; I say, moreover, that they are often ignorant of the conditions of a good and faithful measurement.'

"There are fractures of the femur, however, as Malgaigne admits, which may be cured without shortening, but, in almost all of these, the fragments are so interlocked (maintenu par leurs deuteleures réciproques) that there was no shortening from the first, which could only have been ascertained by measurement. One means which surgeons have adopted to determine as to the existence or non-existence of shortening, is to observe, when the cure has been fully completed, whether there is a perceptible limp in the gait; if not, they persuade themselves that there is no shortening. But the fallacy of this test (though sufficient for all practical purposes) is obvious, when it is known that in nine Cases out of ten there will be no limp, though the shortening by measurement amounts to one-half or three-quarters of an inch; and I have seen patients walk some months after the cure of a fractured thigh, without any perceptible limp, with an inch or even more of shortening, and without the aid of a thick-soled or high heeled shoe. This I have assured myself of by actual observation and measurement, and so have many of the other surgeons who have been and still are connected with the hospital. We see the same result sometimes after compound fractures of the leg, when a portion of the whole calibre of the bones has been removed.

"A shortening, however, which will give rise to a perceptible limp in one person, will not be observed to affect the gait of another in any degree. It is probable that the pelvis adapts itself in some degree to the altered length of the limb, when it is considerable. Many surgeons think it only necessary to place the limbs side by side, and thus compare their relative length, to determine whether there be any shortening; indeed this has been almost the universal practice, and yet this mode is as fallacious as the other, for when the two limbs are apparently most accurately adjusted side by side in a line with the trunk, the shortened limb, from some cause or other, very frequently appears the longer, and the relative length of one may be made to vary at least an inch in appearance by an inappreciable change in its position with respect to the trunk. I am confident that an inch and a quarter of shortening might be, in many cases, overlooked in an examination conducted in this manner, so that no surgeon is prepared to say that his cases have recovered without shortening, until he has carefully measured the two limbs; and this measurement requires considerable tact and practice. The points we select are the anterior superior spine of the ilium and the inner malleolus, taking care to have the patient properly arranged on a hard mattress; when these points are tolerably prominent, as we usually find them, the measurement can be accurately made out; perhaps the variation of an eighth of an inch might take place. When these points are less prominent, as they are apt to be in fat persons and in females, the probable variations will, perhaps, amount to one-fourth of an inch. We do not trust to one measurement, but to the comparative results of two or three.

"Having premised these observations, which we have felt compelled to make at some length, in order to clear the surgeons attached to the New York Hospital of any imputation of neglect, or want of skill in treatment of fractures, when we say that our average shortening in fracture of the femur has been three-quarters of an inch; and that while we do, now and then, get a cure without shortening, especially in children, the difference in length is sometimes an inch or more, even with the most attentive care."

Dr. Lente believes, however, that with the improved mode of extension, by adhesive plaster, then but recently adopted in the hospital, much better cures will be made; and indeed, such had already been the experience of the surgeons of that institution, and he is disposed to regard it as one of the most valuable improvements in surgery which have been suggested for many years.

It is not to be denied, however, that a few surgeons in all parts of the world have claimed, and still continue to claim, in their own practice, or from the adoption of their own peculiar plans of treatment, much better success. Indeed, some of them do not hesitate to affirm that, as a general rule, any degree of shortening is quite unnecessary.

Mr. Amesbury declares, that when the fracture is in the "middle or lower third," under a "judiciously managed" application of his own splint, "consolidation of the bone takes place without the occurrence of shortening of the limb, or any other deformity deserving of particular notice."[1]

Mr. South, in a note commenting upon an opposite sentiment expressed by Chelius, and already quoted, remarks: "In simple fractures of the thigh-bone, except with great obliquity, I have rarely found difficulty in retaining broken ends in place, and in effecting the union without deformity, and with very little, and sometimes without any shortening. For the contrary results the medical attendant is mostly to be blamed, as they are usually consequent upon his carelessness or ignorance."[2]

Mr. Hunt, of the Queen's Hospital, at Birmingham, who treats all fractures with the *apparatus immobile* of Suetin, has published the results of his observations; and of the simple fractures of the femur only one presented, after the cure, any degree of shortening; and he adds, that all other fractures which he has treated by this method were followed by "equally good results."[3] In relation to which statements, Mr. Gamgee exclaims: "This is conservative surgery. What other mode of treatment would have given such results? And those cases are not exceptional. Mr. Hunt tells us he has selected them from amongst many others equally successful. They accord with the experience recorded in my little treatise on this subject; and the works of Suetin, Burggræve, Crocq, Velpeau, and Salvagnoli Marchetti, record numerous cases no less remarkable and demonstratively conclusive."[1]

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[1] Practical Remarks on Fractures, by Joseph Amesbury, vol. i. p. 384. London ed., 1831.

[2] Op. cit., vol. i. p. 627.

[3] Researches on Pathological Anatomy and Clinical Surgery, by Joseph Sampson Gamgee. London ed., pp 159-160.

Desault, also, according to the passage from Malgaigne, which I have already quoted, "pretended to cure all fractures without shortening." I do not find, however, any other authority for this statement, as here made; neither in his *Treatise on Fractures and Luxations*, edited by Bichat, nor elsewhere. Bichat even says positively, that "Desault himself did not always prevent the shortening of the limb."[2] He declares, however, that "Desault has cured, at the Hôtel-Dieu, a vast number of fractures of the os femoris, without the least remaining deformity."[3]

Dr. Dorsey, of Philadelphia, who employed the apparatus of Desault, as modified by Physic and Hutchinson, was equally successful.[4]

Dr. Scott, of Montreal, Prof. of Clinical Surgery in the McGill College, and Physician to the Montreal General Hospital, has reported 19 cases of fractures of the long bones, taken promiscuously and without selection, from his hospital service, of which 3 belonged to the clavicle, 7 to the femur, 8 to the tibia and fibula, and 1 to the condyles of the humerus. All of which recovered without any degree of shortening or deformity; except the case of fracture of the condyles of the humerus, which occasioned death.[5]

This is not, however, quite so remarkable as the success which has attended the practice of Dr. Carnochan, of the Emigrants' Hospital, New York, under whose care, during the year ending in Sept., 1853, every fracture of a long bone, 49 in number, was made to unite without any measure or quality of deformity. Such, at least, is the statement of the four house surgeons.[6] It is true that the statistical enumeration contains no cases of fractures of the femur, yet no one who reads the report could doubt, but that if such cases had occurred, the results would not have been at all different.

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[1] Op. cit., p. 167.

[2] A Treatise on Fractures and Luxations, etc., by P. J. Desault, edited by Xav. Bichat. Amer. ed., p. 251. 1805.

[3] Op. cit., p. 223.

[4] Elements of Surgery, by John Syng Dorsey, vol. i. p. 163. Philadelphia, 1813.

[5] "Medical Chronicle" of Montreal, vol. i. No. 7, 1853.

[6] New York Med. Gazette, vol. ii. p. 530.

It is never a pleasant duty to call in question the accuracy of another's statements, as to what he has himself alone seen and experienced. The circumstances which would justify such an expression of scepticism, where the witnesses, as in this case, are presumed to be intelligent and honest men, must be extraordinary. Such, however, I conceive to be the circumstances in this instance. It is certainly very extraordinary that a few gentlemen of acknowledged skill, but whose means and appliances are concealed from no one, are able to do what nearly the whole world besides with the same means, acknowledges itself unable to accomplish. Such is the fact nevertheless: and our lack of faith in their testimony is only a necessary result of our experience, and of the experience of the vast majority of practical surgeons, as opposed to theirs.

I might properly enough dismiss this subject with no further argument than may be found in the overwhelming testimony of practical surgeons, that broken femurs do in their experience rarely unite without more or less shortening; but I cannot avoid calling attention to the evidence of the falsity of the opposite opinion, which is furnished by the testimony of the very persons who themselves claim to have obtained such fortunate results.

It is not, as might have been supposed, one particular form of dressing, which in itself peculiar, and more perfect than all others, has furnished these results. On the contrary, the plans of treatment have been constantly unlike, and sometimes quite opposite. Thus: Desault used a straight splint, with extension and counter-extension, and he refused to adopt the flexed position recommended by Pott, because his experience and the experience of other French surgeons, had taught them its inutility.[1] Adopting the straight position, he made perfect limbs; with the flexed position, he found it impossible to do so. Dorsey used the splint of Desault, as modified by Physic and Hutchinson.

South, whose success seems to have been equal to that of Desault or Dorsey, adopts also the straight position; but he employs no means for making permanent extension, except what may be accomplished through the medium of four long side splints applied after "gentle" extension has been made by the assistants.

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[1] Works of Desault. Op. cit., p. 225.

Mr. Amesbury, on the other hand, made perfect limbs only with his own double inclined plane; and speaking in general of the various plans hitherto contrived, not excepting that invented by Desault, or the method practised by South, which had already been recommended by several surgeons, he declares that "they are seldom able to prevent the riding of the bone, and preserve the natural figure of the limb. Indeed, so commonly does retraction of the limb occur under the use of the different contrivances usually employed, that I have heard a celebrated lecturer (now retired) in this town, publicly assert, that he never saw a fractured thigh-bone that had united, without riding of the fractured ends!"[1] And in his "*General Inferences*," he uses the following emphatic language: "The contrivances which are commonly used in the treatment of these fractures, do not sufficiently resist the operation of the forces above mentioned, but suffer their influence to be exerted upon the bone, in all cases more or less injuriously, and at the same time often assist in *producing* displacement of the fractured ends; so that deformity, differing in kind and degree in different cases, is almost the constant result of fractures of the femur treated by these means."[2]

While Mr. Gamgee, a writer of much talent and industry, thus broadly contradicts the statements of Desault, South, Dorsey, and Amesbury, and administers a severe rebuke even upon the illustrious Liston. "Pott's plan, the long splint, M'Intyre, and their modifications, as a rule entail sensible deformity, which in many cases is very considerable. It is a significant fact, that, though the example established in University College Hospital by the late Mr. Liston, of treating fractures of the thigh by the long splint, and of the leg by the modified M'Intyre, which are admitted equal, if not superior, to other splints, was rigidly followed in that institution, the patients admitted with broken thighs or legs were frequently discharged with manifest deformity."[3]

With how much force his own remarks as to the experience of the University College Hospital will apply to the starched bandages used by himself, you, gentlemen, will determine when referred to the opinion of Velpeau, already quoted, who claims no result better than an average shortening of half an inch. It is true, however, that M. Velpeau prefers and advocates the starched bandage, but it is not true that he claims to be able to prevent a shortening of the bone.

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[1] Amesbury on Fractures, &c., vol. i. p. 310.

[2] Op. cit., vol. i. p. 384.

[3] Advantages of the Starched Apparatus, by Joseph Sampson Gamgee. London, 1853, pp. 54–55.

"What other modes of treatment would have given such results?" This question, propounded, no doubt honestly, by Mr. Gamgee, has here its fair and satisfactory answer. Almost any of the various modes named; for if we must receive his testimony, we are equally bound to receive the testimony of Desault, South, Dorsey, Amesbury, Scott, and Carnochan. If we give credit to Mr. Gamgee, so far as to doubt the statements of these latter as to the degree of success claimed by them, by the same rule we must doubt his own statements, also, as to the degree of success claimed by himself. This I say with all sincerity and kindness, fully believing that these gentlemen are mistaken, and not that they intentionally misrepresent the facts.

In conclusion, I wish to say briefly, that in view of all the testimony which is now before me, I am convinced—

First. That in the case of an oblique fracture of the shaft of the femur occurring in an adult, whose muscles are not paralyzed, but offer the ordinary resistance to extension and counter-extension, and where the ends of the broken bone have once been completely displaced, no means have yet been devised by which an overlapping and consequent shortening of the bone can be prevented.

Second. That in a similar fracture occurring in children, or in persons under fifteen years of age, the bone may sometimes be made to unite with so little shortening that it cannot be detected by measurement; but whether in such cases there is in fact no shortening, since with children especially it is exceedingly difficult to measure very accurately, I cannot say.

Third. That in transverse fractures, or oblique and denticulated, occurring in adults, and in which the broken fragments have become completely displaced, it will generally be found equally impossible to prevent shortening; because it will be found to be generally impossible to bring the broken ends again into such apposition as that they will rest upon and support each other.

Fourth. That in all fractures, whether occurring in adults or in children, where the fragments have never been completely or at all displaced, constituting only a very small proportion of the whole number of these fractures, a union without shortening may always be expected.

Fifth. That when, in consequence of displacement, an overlapping occurs, the average shortening in simple fractures, where the best appliances and the utmost skill have been employed, is between one-half and three-quarters of an inch.

Regarding the middle of the shaft of the femur as the type of all of the fractures of the femur, in respect of prognosis, and measurably in respect of treatment, and understanding the remarks which have already been made as especially applicable to lesions at or near this point, it will be easy to make a proper application of these conclusions to other fractures occurring through the different portions of this bone.

If we consider the muscles alone as the cause of the displacement in the direction of the long axis of the shaft, the shortening of the limb, other things being equal, must be proportioned to the number and power of the muscles which draw upwards the lower fragment. This will vary in different portions of the limb, but no where will this cause cease to operate, nor will its variations essentially change the prognosis.

I have not intended to say that other causes do not operate occasionally in the production of shortening, but only that muscular contraction is the cause by which this result is chiefly determined, and that its power will be ordinarily the measure of the shortening.

The following propositions relative to fractures of the neck of the femur, I believe to be substantially correct; and I shall take the liberty of stating them dogmatically, waiving, for the present, the evidences upon which they seem to me to rest.

First. Fracture of the cervix femoris within the capsule, when incomplete,[1] or when the fibrous and synovial capsules are not torn —in short, whenever from any cause the fragments do not separate—may unite either through the medium of fibrous structure, or of bone.

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[1] Colles, Adams, King, and Tournel have reported examples of partial fracture of the neck of the femur; but none of these examples are regarded by Robert Smith as having been sufficiently attested. The specimen, however, laid before the Boston Society for Medical Improvement, in Sept. 1856, by J. B. S. Jackson, of Boston, must be regarded as conclusive, as to the possibility of this accident.

For a more full account of this specimen, see *Boston Med. and Surg. Journal* for 1856; also, an interesting paper on Fractures of the Neck of the Thigh-bone, by Reuben D. Mussey, of Cincinnati, published in the April No. for 1857, of the *Amer. Journ. of the Med. Sciences.*

Second. When, however, the fragments have been once completely, or in any considerable degree separated, it is probable that union always occurs through the medium of fibrous structure alone, or that no union takes place.

Third. When the fracture is extra-capsular, impaction of the fragments is the rule, and not, as in intra-capsular fractures, the exception.

Fourth. In extra-capsular fractures the impaction, when it occurs, is more complete than in the case of intra-capsular fractures.

Fifth. When shortening follows as a consequence of displacement, in the case of intra-capsular fractures, it is not always immediate, but may be delayed several days, and then take place either suddenly or gradually.

Sixth. On the contrary, in extra-capsular fractures a manifest shortening almost always takes place immediately, and seldom does the limb shorten subsequently.

Seventh. Examined on the first day after the occurrence of the fracture, intra-capsular fractures, as compared with extra-capsular, will probably show the smallest average of shortening.

Eighth. Examined after the complete recovery, or after the lapse of several years, the reverse of the seventh proposition will be found true.

It is not my intention to speak with more particularity than I have already done, of the form and direction of the deviations which occur with some regularity at the different points of fracture. I will only say that there is much reason to believe that the efficiency of the muscles inserted into the trochanter minor, in producing a forward displacement of the upper fragment, when the fracture is just below this point, has been by some surgeons greatly over-estimated: and a similar remark will apply, only perhaps with less force, to a fracture just above the condyles, where the direction of the fracture is obliquely downwards and forwards.

I may very properly, however, call attention in this place to the unusual direction of the fracture, and character of the displacement, in Case 105, p. 286—the direction of the fracture being from above downwards, and from before backwards, a circumstance which, as occurring at this point, just above the condyles, is probably very rare. The pressure of the lower end of the upper fragment upon the popliteal artery so far arrested the circulation in the lower portion of the limb as eventually to produce a sloughing of a considerable portion of the foot: the death of the foot being preceded by extreme pallor, shrinking, and coldness of the toes.[1]

Sir Astley Cooper does not seem to have recognized this form of fracture and displacement. Amesbury has, however, recorded one case, which came under his own observation, where, although the bloodvessels and nerves escaped, the bone projected through the skin in the ham, and finally exfoliated.[2] And he thinks the point of bone may sometimes so penetrate the artery, and injure the nerves as to render amputation necessary, in order to save the life of the patient.

M. Coural also has related a case in which an epiphysary disjunction, occurring in a child twelve years old, was attended with a displacement of the upper fragment backwards, and amputation became necessary.[3]

I know of no other cases of this rare accident which have been reported. Lonsdale refers to it as "the rarest direction for a fracture to take;"[4] and thinks that in case of its occurrence, the vessels in the popliteal space will stand a chance of being wounded; but he mentions no example. I have seen, however, in the valuable collection of bones belonging to Dr. March, of Albany, an oblique fracture of the femur just above the condyles, in which the upper fragment is behind the lower. It is united by bone, and with a shortening of two and a half or three inches.

The popliteal artery hugs the bone so closely at this point, that a displacement of the upper fragment in a direction downwards and backwards, must always greatly endanger its integrity. Indeed, it is here that the artery and vein are in the closest contact with each other, and with the bone: an anatomical fact, which has been used by Richerand and others to explain the greater frequency of aneurisms in the ham.

Especial notice ought also to be taken of the unusual case reported by Dr. Alph. B. Crosby, of Hanover, N. H., of a fracture of the external condyle of the femur, the small fragment having been successfully removed by Dr. Crosby, after the lapse of six months. The case is reported at length in the *New Hampshire Med. Journal*, for 1857, and the size and form of the fragment are illustrated by a drawing which accompanies this report. I have at this moment the specimen in my possession, it having been sent to me by Dr. Crosby, for examination, and there can be no doubt that the opinion of this distinguished surgeon, as to the character of the fracture, is correct.

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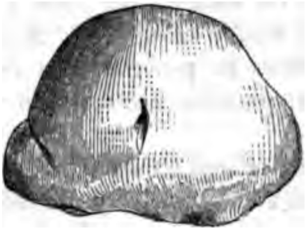
[1] For a more full account of this case, see *Buffalo Med. Journal*, vol. xii. p. 41, Dec., 1856.

[2] Remarks on Fractures, &c., by Joseph Amesbury, vol. i. p. 293. London, 1831.

[3] Archiv. Gén. de Méd., tom. ix. p. 267; also Malg., Op. cit., p. 733.

[4] Treatise on Fractures, by Ed. F. Lonsdale, p. 319. London, 1838.



Dr. Crosby's specimen of fracture of the external condyle.

The reported cases of a fracture of one of the condyles of the femur are not numerous. Sir Astley Cooper and Bransby Cooper have each mentioned one case; Boyer has reported one case; Malgaigne has seen three, and there are three specimens in the Dupuytren museum. One case also is reported in the 15th vol. of *Braithwaite's Retrospect*, p. 149.

Dr. Wells, of South Carolina, has reported a case of dislocation of the knee, accompanied with a fracture of the inner condyle. The patient died on the second day. An examination after death showed "that a thick scale of bone was fractured from the inner part of the inner condyle, and remained attached to the ligament."[1] And Dr. Kirkbride has reported a case of fracture of the external condyle, which was presented at the Pennsylvania Hospital, and which resulted in a very perfect cure.[2]

Note.—I have seen no case of a fracture through, or between the two condyles, extending into the joint, except a single specimen contained in the museum of the University of Pennsylvania.

Nor has it ever occurred to me to meet with an epiphyseal disjunction, occurring as the direct result of violence, either at the upper or lower end of the femur. South had a case of this kind, where the separation occurred through the neck, in a boy ten years old. Dr. Post, of New York, related to the members of the Kappa Lambda Society, in March, 1840, a similar case which had recently come under his observation, in a girl sixteen years old. The limb remained permanently shortened.[1] At a meeting of the New York Pathological Society, held in Oct., 1855, Dr. Markoe presented a specimen, taken from a girl nine years of age, in which the neck was broken, or separated just external to the capsule, and exactly in the line of the epiphyseal junction. The trochanter was also fissured, showing that the lesion had partaken a little of the character of an impacted fracture;[2] and Dr. Parker called attention, in his clinic at the College of Physicians and Surgeons, to what he believed to have been a similar accident in a girl eighteen years old. It had resulted in suppuration, and permanent shortening of the limb.[3]

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[1] Amer. Journ. of Med. Sci., vol. x. p. 25.

[2] Ibid., vol. xvi. p. 32.

TREATMENT.

In pursuance of the plan which has been hitherto observed, in the several sections of my report, I shall devote a few pages to the consideration of the *treatment* of fractures of the femur.

We have no space for a full discussion of the various plans which have been devised and practised by skilful surgeons for the treatment of these fractures. Nor, indeed, is there room for their mere enumeration: and I shall content myself with only a brief consideration of the question of *posture*, as that alone upon which surgeons have at any time greatly differed, and in relation to which, debate is not yet altogether at an end.

All of the early surgeons, so far as we know, adopted the straight position in the treatment of fractures of this bone: either with simple lateral splints, or with long splints, with or without extension, or with only rollers and compresses, or with extension alone.

Such were the unanimous opinions and practice of surgeons, until about the middle of the last century; at which time Percival Pott wrote his remarkable treatise on fractures, distinguished alike for the originality and boldness of its sentiments, and which was destined soon to revolutionize the old notions, as to the treatment of fractures, and to establish in their stead, at least for a time, what has been called not inappropriately, the "physiological doctrine." The peculiarity of which doctrine consisted in its assumption, that the resistance of those muscles which tend to produce shortening can generally be sufficiently overcome by posture, without the aid of extension, and that for this purpose, for example, in the case of a broken femur, it was only necessary to flex the leg upon the thigh, and the thigh upon the body; laying the limb afterwards quietly on its outside upon the bed.

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[1] New York Journ. of Med., vol. iii. (first series) p. 190.

[2] Amer. Med. Monthly, vol. iv. p. 390.

[3] New York Med. Gaz., vol. i. p. 342.

Very few surgeons, even of his own day, ever gave in their full adhesion to the exclusive physiological system as taught and practised by Pott himself, but multitudes, especially among the English, adopted in general his views; only choosing to place the patients upon their backs rather than upon their sides, and laying the limbs flexed over a double inclined plane. To the support of this system of Pott's, thus modified, Sir Astley Cooper, C. Bell, John Bell, Earle, White, Sharp, and Amesbury, lent the influence of their great names, and its triumph, so far as the judgment of the British surgeons was concerned, soon became complete.

In France, and upon the Continent generally, the reception of this system, was more slow and reluctant; but Dupuytren, now for once, taking ground with his great rival, Sir Astley, adopted almost without qualification these novel views. The decision of Dupuytren determined the opinions of a large portion of the continental surgeons, and had it not been for the early and decisive opposition of Desault and Boyer, the great surgeon of St. Bartholomew might have continued for a long time to have enjoyed a triumph upon the Continent, perhaps throughout the world, equal to what had already been decreed to him in Great Britain.

On this side of the Atlantic, the practice of Pott, at least in so far as it applied to the treatment of fractures of the thigh, never gained a distinguished advocate; and but few ever adopted the practice, as modified by White, Amesbury, Bell, A. Cooper, &c.

But whatever may have been the early success of these doctrines, either here or elsewhere, it is certain that a strong reaction has taken place, and that gradually, in all parts of the world, the opinions of practical surgeons have been settling back into their old channel. It would be difficult to find to-day, in France, a dozen distinguished surgeons who adopt the flexed position in the treatment of fractures of the femur. And in England, the reaction is, if possible, even more complete.

In my tour of 1844, during which I visited very many of the hospitals of Great Britain, and upon the continent of Europe, I do not remember to have seen the flexed position once employed in the treatment of a broken thigh; and I shall presently show that the straight position is at the present moment very generally adopted by the best American surgeons.

There have been, then, three grand epochs in the history of the treatment of fractures of the thigh.

First. That in which the straight position was universally adopted; and which reaches from the earliest periods to the period of the writings of Pott, or to about the middle of the last century.

Second. The epoch of the flexed position; which, inaugurated by Pott, had already begun to decline at the beginning of the present century, and which may be said to have been completed within less than one hundred years from the date of its first announcement.

Third. The epoch of the restoration, or that in which surgeons, by the vote of an overwhelming majority, have declared again in favor of the straight position. This is the epoch of our own day.

The opinions of most of the distinguished foreign surgeons upon this question, as upon nearly all other questions relating to our science, thanks to the abundance of our foreign medical literature, are sufficiently well known; while the opinions of my own countrymen, which are often, it will not be denied, entitled to as much respect as those of our transatlantic neighbors, but the medical literature of whose country occupies an humbler rank in the estimation of the world, are but little known even to ourselves. I deem it my duty, therefore, as far as I am able, to mention especially the views and practice of American surgeons.

"Many years since, I introduced into the New York Hospital Boyer's long splint, and continued to use it there, and in private practice, for a long time. I found, however, in many cases, that I had more or less trouble at the foot and groin from the points of extension and counter-extension. I then gradually laid it aside, and for some years have again taken up the double inclined plane.

"From the abundance which I have seen, I am free to say that, if I had my own femur broken, I would be treated upon the double inclined plane.

"The Drs. Burges, Brothers, Court St., Brooklyn, Long Island, have made an improvement upon the extended principle. Their apparatus is now complete, and is in use at the Bellevue Hospital, where I advised, some time since, that it should be tried. It has succeeded admirably in two cases."—VALENTINE MOTT. *Private Correspondence.*

"For the treatment of fractures of the thigh-bone below the neck, I have always used the double inclined plane, as advised by Sir Charles Bell. Fractures of the leg I have treated in both modes, and with about equal success as to the ultimate result. But in these, also, as a general rule, I use the double inclined plane on the plan of Amesbury."—JAMES McNAUGHTON, *Albany. Private Correspondence.*

"I treat all thighs, fractured in their middle part, by the long splint, and in the straight position. In fractures occurring at either end of the bone, I resort at first to the angular splint and the flexed position, and thus place the muscles more at rest; in which position, also, there is less tendency to angular displacement and shortening. After the lapse of a few days, when the disturbed muscles have lost their tendency to spasm, and the hardened cellular tissue about the fracture has formed a sort of bond between the ends of the broken bone, I gently bring the limb down to the straight position, and apply the long splint."—JOSEPH PANCOAST. *Private Correspondence.*

"I am in the habit of treating fractures of the thigh-bone, except in the vicinity of the articulations, in the extended position. I make counter-extension by means of a perineal band attached to the upper extremity of a long splint, extending nearly to the axilla; and extension by means of lateral strips of adhesive plaster secured to the lower end of the long splint. I treat fractures of the os femoris in the neighborhood of the hip and knee-joints in a semiflexed position, in order to diminish the displacement resulting from muscular contraction.

"In the treatment of fractures in general, I have long since abandoned the method which I had been taught to regard as the correct one, viz., to defer the accurate adjustment of the fracture, and the application of splints and bandages, until after the subsidence of the inflammation following the injury. I am now in the habit of replacing the fragments as accurately as possible when I am first called to the patient, and of applying a suitable apparatus to maintain apposition; and every year's experience convinces me more fully, that this course not only secures a more favorable result, but adds greatly to the comfort of the patient. I need not say that in applying bandages to a recently fractured limb, caution is required not to strangulate the circulation.

"In one respect, my practice in the treatment of fractures deviates from that which is pursued by the majority of practitioners. I am in the habit of removing the dressing every day or two, and applying passive motion to the joints in the vicinity, to guard against the rigidity which otherwise becomes so troublesome a symptom. I do not, however, pursue this course in the treatment of fractures of the thigh, on account of the liability to displacement of the fragments."—ALFRED C. POST, *of New York. Private Correspondence.*

"In fractures of the shaft of the femur, immediately below the trochanter minor, I have always dressed the limb with the double inclined plane; elevating the knee decidedly, and padding beneath the ham, if necessary, in a manner to effect moderate extension by the weight of the trunk. In a *transverse* fracture, also, of the middle of the shaft, with a good deal of pains-taking, I succeeded satisfactorily with an Amesbury's splint.

In all other fractures of the shaft, constituting, at least, nine-tenths of the whole, I regard the straight position of the member as indispensable to success."—JOHN DE LAMATER, *Cleveland, Ohio. Private Correspondence.*

"My usual, but not exclusive method of treating fractures of the os femoris, is by some mode of extension in the straight position. My preceptor, Warren, secundus, rarely employed any other method, and my impressions—too indefinite and inexact for your present purpose—are that he brought most of his cures out with but little deformity or shortening. As to the results of my own practice in this particular instance, as well as in the whole section of surgery to which it belongs, although my patients have generally recovered with useful limbs, yet such a retrospect as I am able to make, favors the same conclusions as those to which your record of a very large and diversified experience is calculated to bring us, respecting the imperfect state of this department of our art.

"Of late years I have generally employed Liston's single long splint; having it thickly padded, and then applying a roller from the foot to the hip, in such a manner as to secure the limb firmly to the splint. This is about the only case in which I now wrap a fractured limb with a roller." * * * * * *

"I have repeatedly used, and with much satisfaction, in the fractures to which you refer, extension by means of the pulley, having the co-operation only of short lateral splints at the place of the fracture. With a mattress slightly inclined towards the head, and moderate, but persistent traction made on the injured limb by a weight made fast to the foot by means of a cord passing over a pulley—the pulley being secured to the foot-board. I have conducted some tolerably oblique fractures to a satisfactory termination, and with much more comfort to the patients than attends any other equally effectual method of extension."—JOSHUA B. FLINT, *Louisville, Ky. Private Correspondence.*

"In the treatment of fractures of the femur, I employ neither the straight nor the flexed position exclusively, but the one or the other, according to the site of fracture. If the fracture involves either the upper (below the trochanter minor) or the lower third (above the condyles) of the femur, I make use of the double inclined plane of Sir Charles Bell. If, on the other hand, the seat of fracture be in the middle third of the thigh, I greatly prefer the straight, long splint of Mr. Liston.

"My reasons are briefly the following: In fractures below the trochanter minor, the upper fragment is tilted forwards and upwards, by the unrestrained action of the psoas muscle, so that no extension in the straight direction will avail to draw down the upper in a line with the lower portion of the lever.

"The same thing results in fractures of the lower third, but in opposite directions. Here the heel becomes the fixed point, and the gastrocnemii draw the lower fragment backwards and downwards, whilst the upper fragment projects in front. Rectilinear extension can no more correct the malposition of the lower fragment in this case, than it can in the former that of the upper. But in both (upper and lower third fractures), by placing the limb over a double inclined plane, these otherwise insuperable deviations of the fragments are prevented, and the whole bone is brought into proper line.

"When, on the contrary, the fracture implicates the middle third or even the middle half of the femur, I invariably employ the straight splint, which I regard as by far the simplest, most effectual, and best means of treatment: and, indeed, but for the reasons assigned, I should only be too glad to use it exclusively in the management of all fractures of the thigh.

"My cabinet presents several specimens of broken femurs, which illustrate the soundness of these views: in which the abnormal direction of the fragments alluded to as occurring in fractures of the upper and lower thirds, is very marked; the deformities having resulted from treatment in the straight position. So far as function and symmetry are concerned, the lower deformity is altogether the most serious. The unseemly projection above the knee, the unnatural exposure in front of the articular surfaces of the condyles, which are not set bluffly on those of the tibia, together with the altered site of the patella, and the diminished power of the quadriceps muscle, both weaken and deform the joint.

"With regard to the management of fractures below the trochanter minor, or at other points of the femur, by means of the double inclined plane, I am well aware of the difficulty of properly confining the pelvis, but this objection I am far from considering as insuperable. So, too, the outward tendency of the upper fragment, caused by the gluteus, may be humored by carrying the limb off at an oblique angle to the axis of the body.

"It is, perhaps, needless to add, that in fractures of the condyles, of the inter-trochanteric portion, as well as of the neck of the femur (when osseous union is attempted), whether within or without the capsule, I likewise give preference to the straight position.

"I will here also incidentally state that I have found much satisfaction in the treatment of fractures of the leg (tibia and fibula), by the long splint in unruly patients, and those suffering the complication of delirium tremens. The apparatus is applied as in fractures of the thigh, more attention of course being paid to the adjustment of the leg."—CHARLES A. POPE, *St. Louis, Mo. Private Correspondence.*

"In the early part of my practice, following the advice of Dr. Physick, I treated all cases of fracture of the thigh with the long straight splint of Desault; afterwards adopting the practice of Dr. Nathan Smith, I treated many cases by placing them in the flexed position, upon some form of the double inclined plane.

"For many years past, I have selected one or the other of these methods, according to the age of the patient, and the form and position of the fracture.

"In the fractures of the thigh in children, which are commonly near the middle of the bone, and less oblique than in the adult, and in whom the muscles are less active in shortening the limb, I have usually preferred the flexed position, depending very much upon frequent examination and readjustment of the parts, as well as the dressings, when necessary, for preserving the bones in their place. In fractures of the neck of the bone, or through the trochanters, I have used exclusively the long splint, as no other method can be relied upon for preserving the length of the limb.

"Oblique fractures, near the middle of the bone, in the adult, have been usually treated in the same way. The practical difficulty in the use of the long splint is the pain and subsequent inflammation produced upon the parts to which extension and counter-extension are applied. Of late, much of this has been avoided by making extension with adhesive straps, as recommended by Dr. Josiah Crosby, of New Hampshire.

"In fractures of the upper part of the shaft of the bone, the lower end of the upper fragment is so much tilted forwards by the flexor muscles of the thigh, that it is difficult, perhaps impossible, with the limb in the straight position, to bring or retain the two portions of the bone in a line with each other. For this reason, I treat fractures of this kind in the flexed position.

"So, also, in fractures of the lower end of the bone just above the trochanter, I prefer the flexed position. These fractures, so far as I have observed them, have usually been oblique from before upwards and backwards, with the lower fragment rolled forwards by the gastrocnemii muscles. This displacement is readily remedied in the flexed position, and as the fractured surfaces are large, there is little tendency to shortening of the limb. The cases of this kind which I have seen, have recovered quite as perfectly as any other fractures of the thigh.

"In fractures of the neck of the bone, either partially or entirely within the capsular ligament, so common in persons advanced in life, I have rarely employed any firm dressings with the view of preserving the length of the limb. The prospect of any resulting benefit from their use is so slight, while they are so annoying, and not unfrequently so injurious to the health of persons at an advanced age, that I have not thought it best to employ them. I have seen no distinct case of this kind, in which any other than ligamentous union has taken place.

"In one of this kind, many years ago, a very fair one, the patient being a spare and healthy man, about sixty-five years old, I tormented him for about six weeks with the long straight splint, preserving the limb of about its full length for this time, so that on placing him upon his feet, the heel of that side came fairly to the floor; as soon as he began to bear weight upon it, it commenced to shorten by the yielding of the ligament, until it was more than an inch shorter than the other, and in about the usual state as those in which the most simple treatment is employed.

"I have seen several cases of interlocking fracture, as I supposed them to be, in which the symptoms of fracture have been so obscure as to lead to a doubt of its existence.

"These have rarely recovered perfectly, there being usually some eversion of the limb, with some restraint of the motion of the joint.

"A case of this kind, which was accidentally rendered a perfectly plain one, may perhaps interest you sufficiently to warrant a statement of it. A lady, about sixty years old, while getting out of a carriage, caught her foot in the stirrup and fell to the ground, striking on the trochanter. An intelligent physician, who saw her at once, did not detect a fracture. She was able to ride home, a distance of about thirty miles, in a carriage, with little inconvenience.

"Upon examining her, I found her suffering little pain when at rest, except such as is common after a bruise. There was no deformity of the limb of any kind; I could give all the motions to the limb, to a moderate extent, while if larger motions were attempted, a good deal of pain and resistance of the muscles was produced. This pain upon motion, together with the inability, when lying upon the back, to raise the limb from the bed were the only symptoms of fracture. She continued in this way for three or four days, suffering very little, and able with very little assistance to move herself from the bed to a chair, and sit comfortably for several hours in the day. While sitting in this way, she attempted to raise herself erect, with her hands upon the arms of the chair. When this was partly accomplished, the arm of the chair next to the injured limb broke, and she struck forcibly, for she was a heavy woman, upon the trochanter. This was followed by severe pain, by eversion, and shortening of the limb, and by all the symptoms of fracture of the neck of the bone. After a long confinement, she had the imperfect recovery which is common in such cases. I had no doubt that the fracture was produced by the first fall, and the displacement by the second."—JONATHAN KNIGHT, *New Haven. Private Correspondence.*

"I have used the long outside splint in fractures of the thigh for many years, and prefer it to any other. I use as little bandage as possible, leaving the limb free from unnecessary pressure. In some instances, when the patient has been careful and intelligent, I have relied on extension made permanently at the head and foot of the bed, leaving off all splints after the first few days."—J. H. ARMSBY, *Albany. Private Correspondence.*

"Dr. Flagg, to whom you addressed a note through Dr. Morland, in regard to the fracture apparatus in use at our hospital" (Massachusetts General Hospital, situated at Boston), "is long since dead.

Dr. Morland has requested me to supply you with drawings, and descriptions of it. The apparatus was introduced into the hospital by my father, and has been somewhat modified from time to time. It is, I think, the best apparatus employed anywhere, and I have examined particularly the construction of these instruments, both in this country and in other parts of the world. I inclose a description and drawings, made by Dr. L. M. Sargent, artist to the hospital." * * * * "This apparatus I use for all fractures of the thigh, and have at present seven patients with it applied. We use it for fractures of the neck of the femur, as well as for fractures of the shaft."—J. Mason Warren, *Boston. Private Correspondence.*

"For all fractures of the thigh-bone, I employ the extended position of the limb. There are but few cases in which extending force is not necessary to prevent the degree of deformity or shortening which would occur without it. Of thirty specimens of fracture of the shaft, in my collection, only two are transverse. In fractures of the neck, especially with old subjects, I sometimes avoid the application of any kind of apparatus for permanent extension; but in all cases, whether of the neck or shaft, where such extension is attempted, I have found the straight position of the limb to be the most reliable."—Reuben D. Mussey, *Cincinnati. Private Correspondence.*

"If I should be asked under what circumstances I would use the double inclined plane in case of fracture of the femur, I would unhesitatingly answer, never! I have long since abjured the double inclined plane in every form of fracture of this bone, finding the straight splint fully adequate to all purposes for which any apparatus of this kind is required. In support of this statement, I could furnish a great number of cases showing that the locality of the fracture, the importance of which is so much dwelt upon in the books, constituted, in no case, a valid objection to its use."—G. Kimball, *Lowell, Mass. Private Correspondence.*

"In reply to your question, 'What position do you adopt in the treatment of fracture of the thigh-bone?' I answer emphatically, the straight. Many years ago, before I had much experience in this class of injuries, I occasionally employed the flexed position, but I soon found that it was objectionable, on account of the great difficulty in maintaining so accurate apposition of the ends of the fragments. Of late years I have confined myself entirely to the use of the straight position, and I have never had any cause to regret it. In the adult, I sometimes employ the apparatus of Desault, as modified by Physick, but much more frequently one of my own construction, somewhat upon the principle of that of Dr. Neill, described in the *Philadelphia Medical Examiner* for 1855. I have used it for nearly twenty years, and it has generally answered the purpose most admirably in my hands. It consists simply of a box for the thigh and leg, with a foot-piece, and two crutches, one for the axilla and the other for the perineum, to make the requisite extension and counter-extension. With such an apparatus, an oblique fracture of the thigh can be treated with great comfort to the patient, and with the assurance of a good limb. In children, I have effected some excellent cures simply by means of a sole leather trough, well padded and provided with a foot-piece.

"The great objection to the flexed position is the difficulty of keeping the ends of the broken bones in apposition: the upper one having a constant tendency to pass away from the inferior. Other objections might be urged against the flexed position, but this is quite sufficient to induce me to reject it."—S. D. GROSS, *Philadelphia. Private Correspondence.*

An interesting letter from Dr. Paul F. Eve, of Nashville, Tenn., I regret to say, has been mislaid. He prefers the straight splint in all fractures of the thigh, except when the fractures occur near the upper or lower end of the bone.

"In regard to fractures of the thigh and leg, I can only say that I prefer the straight position for the treatment of both, and in nearly all cases I employ it. I have no doubt, however, that as good cures can be made with the flexed position, though I think it requires more care and attention in the treatment to do so, besides being less comfortable to the patient, and more difficult to measure accurately the limb."—GEO. W. NORRIS, *Philadelphia. Private Correspondence.*

The following additional remarks, contained in Dr. Norris's letter, although not entirely apposite, are too valuable to be withheld. "Permit me to suggest to you to say something in your forthcoming work on the early inspection, and the frequency of dressing in fractures—points which seem to me to be not sufficiently attended to by our writers and teachers, and to be greatly needed. How common is it to see fractures done up and not examined for several days, and then, if the injury has been oblique, to find when opened that it is accompanied with displacement? In those about the wrist, as well as in the leg and thigh, I am sure I have often seen mischief arise from want of early dressing. Students and practitioners who do not see much surgery, are apt to imagine that examination of the fracture and replacement of the apparatus are necessarily accompanied with pain and disturbance of the injured bone, and hence avoid it. Neither of these, however, are necessary accompaniments of the examination and re-dressing of a fracture if there be no displacement, and should there be, an opportunity is thus afforded for remedying it before it is too late.

"Another defect in the treatment of fractures about the joints which I should like to see noticed by you, is the necessity of frequent dressing in the latter stages of the cure, and the giving of careful passive motion to joints that are confined by the apparatus. In fractures near the hand, for example, particularly in the laboring classes, such motion during the cure, to the wrist and finger-joints, is all-important; as, unless practised, these cases are constantly followed by false anchyloses which require a long time to overcome, and which, in some degree at least, might be avoided by following a different course. A mention of these things in your book, though, in the eyes of those who are daily called on to treat such accidents, very ordinary matters, would, I think, be calculated to direct attention to them, and do much good in our country.

"From all that I have seen of the treatment of fractures, I am a warm advocate for frequent dressings, wherever the fractures may have occurred—in the early stages, to prevent displacements, excoriations, &c., and in the latter stages in order to give passive motion to the neighboring joints, which I know can be done without injury to the fracture. Of late years, I have been in the habit of dwelling upon these little matters as of importance, at our hospital. At the same time you must understand me as being a stanch advocate for a state of perfect rest, as, in my opinion, the only proper one for broken bones." See also remarks by Norris on bad effects of early application of tight bandages, *Amer. Journ. of Med. Sciences*, vol. xxii. p. 292.

In addition to these opinions of well known and distinguished American surgeons, which I have been permitted to declare, I will remind you also of the practice of those whose opinions, having already found a record, demand only from me a suitable reference.

The following surgeons recommend the straight position:—

Physick,[1] Dorsey,[1] Gibson,[2] Horner,[3] J. Hartshorne,[3] H. H. Smith,[3]

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[1] Elements of Surgery, by John Syng Dorsey. Philadelphia, 1813, p. 175.

[2] Institutes and Practice of Surgery, by Wm. Gibson, 6th edit., vol. i. Phila.

[3] Treatise on the Practice of Surgery, by Henry H. Smith. Phila., 1856.

Neill,[1] Bache,[2] Daniell,[3] R. Coates,[4] Howe,[5] Flagg,[6] Dugas,[7] and Caldwell;[8] while the following gentlemen have given a preference to the flexed position: Nathan Smith, of New Haven;[9] Nathan R. Smith, of Baltimore;[10] and Nott, of Mobile.[11]

With one or two exceptions, it is probable that the straight position is adopted in the treatment of broken femurs in every large hospital in this country. Such I believe to be the practice in the Massachusetts General Hospital, of Boston; in the hospital under the care of Dr. Kimball, at Lowell, Mass.; in the New York City Hospital[12] and at Bellevue; in the Pennsylvania Hospital, of Philadelphia, and at Blockley. All of the surgeons attached to the Buffalo Hospital of the Sisters of Charity, including the marine wards—viz., Drs. Winne, Smith, Boardman, Samo, Wilcox, with myself—adopt the straight position, with but occasional exceptions.

The practice of treating fractures of the thigh, as well as all other fractures of the long bones, with the roller alone, and without either lateral splints or extending apparatus, first suggested by Radley, has found in this country but one distinguished advocate, Dr. Dudley, of Lexington, Ky.[13]

The general plan of treatment preferred by the writer has already been stated, and it only remains to allude briefly to certain points which do not seem to have received sufficient notice from systematic writers, or which may for other reasons possess a peculiar interest.

Without limiting ourselves to the consideration of any one of the special forms of apparatus, we may say that the following ought to be regarded as essential elements in the construction of the long straight splint: Length sufficient to extend at least several inches above the alæ of the pelvis, and the same distance below the foot; such thickness as that it shall be firm and unyielding; width sufficient to make it serve as one of the lateral splints, since over all the properly called lateral splints it possesses this advantage, that it can never become displaced downwards or upwards; its width ought seldom to be less than three and a half inches, nor should its width diminish as it descends towards the foot, as in consequence of this construction the roller, which is intended to secure the limb to the splint, has a constant tendency to slide in the same direction.

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[1] Philadelphia Med. Examiner. October, 1855.

[2] Note to Erichsen's Surgery. Philadelphia edition, p. 225. 1854.

[3] Amer. Journ. Med. Sciences, vol. iv. p. 330. (Employs a pulley for extension—represented by a drawing.)

[4] Ibid., vol. xx. p. 18.

[5] Boston Med. and Surg. Journ., vol. xxii. p. 228. (With a drawing of apparatus.)

[6] Ibid., vol. xxv. p. 223.

[7] Southern Med. and Surg. Journ. Feb. 1854.

[8] Desault's Surgery. American edition, p. 407.

[9] Amer. Med. Rev. Published at Philadelphia, 1825, vol. ii. p. 355. Also, Medical and Surgical Memoirs of Nathan Smith. Published at Baltimore, pp. 129—141.

[10] Med. and Surg. Memoirs, pp. 143—162. See also Geddings, Baltimore Med. and Surg. Journ., vol. i. 1833; and Sargent's Minor Surgery, p. 171.

[11] Amer. Journ. Med. Sciences, vol. xxiii. p. 21.

[12] Lente's Statistics of Fractures, N. Y. Journ. of Med., Sept., 1851; N. Y. Med. Gaz., vol. ii. p. 186.

[13] Amer. Journ. of the Med. Sci., vol. xix. p. 270; Transylvania Journal, April, 1836; Boston Med. and Surg. Journ., vol. xxxiv. p. 35.

A foot-piece, or transverse block to which the foot may be attached for the purpose of making extension as nearly as possible in the axis of the limb. If this foot-piece is movable, it will serve only the single purpose above mentioned, and no rule need govern its width. But in this case there must be another block attached to the bottom of the long splint, at right angles with the shaft, and of the same width as the splint; the object of which will be to support and steady the side splint, and to prevent its rolling inwards or outwards. Where this is neglected, frequent disturbance of the broken fragments, and a deformity from inclination of the foot outwards or inwards, are apt to ensue. If the foot-piece is not movable, then it may be of the same width as the side splint, and serve both to steady the side splint and as a means of extension. Its length ought not to be such as to interfere with a long inner splint, in case its use should be deemed advisable.

With two fenestra placed at the upper part of the splint, for the reception of the counter-extending band, the long outside splint is now complete.

These are, so to speak, its simple elements, and compose the splint in its rudest form, without which no splint can be perfect, yet upon which many real improvements may be based. Thus, it must be regarded as an improvement to have the splint so constructed as that it may be readily lengthened or made shorter, to accommodate itself to the size of the patient; or that the foot-piece should be furnished with a screw, for the purpose of making the extension more uniformly; or that the same mode of operating should apply also to the counter-extension.

The adhesive plaster bands are beyond all comparison the best means of making a permanent extension which are at present known to surgeons. Hitherto, one of the most serious difficulties in the way of extension, and the objection which has been most effectively urged against its adoption, has been the excoriations, ulcerations, and even sloughing, which so often occurred from the use of the various extending bands about the ankle. This, together with the injuries occasionally inflicted by the perineal band, has been regarded by other surgeons than Dr. Mott, whose opinions we have already quoted, as a sufficient reason for preferring the flexed position. But no one who has employed the adhesive plaster extending bands will doubt that, so far as injuries to the foot and ankle are concerned, this objection is now entirely disposed of. It is adopted in many, perhaps most, of the American hospitals, and in no case where it has been employed have I known the slightest excoriations to have been produced. I regard this simple invention, therefore, as one of the most important improvements in the treatment of fractures of the thigh, and it is not surprising that several claimants have appeared for the original suggestion. By Mr. Brinton it has been claimed for Dr. Ellerslie Wallace, of Philadelphia;[1] and by Dr. Sargent for Dr. Gross, of the same city;[2] while by American surgeons generally the invention has been conceded to Dr. Josiah Crosby, of New Hampshire, to whom certainly is due the credit of having brought it into notice, if not, indeed, of the first suggestion.[3]

The mode of using adhesive plaster for extension is briefly as follows:—

A single band long enough to extend from a point just below the knee, to twelve or sixteen inches beyond the foot, and about three inches wide, is to be applied along each side of the leg. Instead of one band on each side, two may be employed; which shall traverse each other somewhat obliquely, so that one band shall fall a little in front of the malleolus and one a little behind. Having wrapped the whole circumference of the ankle, including the malleoli and heel, in a heavy pledget of cotton, laid underneath the adhesive bands, a roller is now to be applied from the toes upwards as far as the knee, and secured with a little flour paste or starch. Before fastening the bands to the foot-block, each band should be twisted into a rope below the foot; and to prevent any degree of lateral ure upon the sides of the ankle and foot, already tolerably cted by the cotton, a piece of thin board, longer than the width of the ankle, and notched at each extremity, should be placed between the bands below the bottom of the foot.

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[1] Note to American edition of Erichsen's Surgery, p. 225.

[2] Note to 3d American edition of Miller's Practice of Surgery, p. 653. See also N. Y. Med. Gaz., vol. iv. p. 87.

[3] See cases reported in N. H. Journ. of Med., for 1851; also, N. Y. Journ. of Med., vol. vi., 2d series, p. 137. See also, Trans. Amer. Med. Assoc., vol. iii. p. 382.

The attempt to use the adhesive plaster also as a perineal band, for the purpose of making counter-extension, does not seem to have been equally successful, and we have still to incur the risk of ulcerations, &c., from this portion of our dressings;[1] fortunately, however, the perineal band never completely ligates the limb, and it has rarely, therefore, been found so mischievous as the ordinary extending bands at the ankle. In the fracture apparatus lately invented by the Burges, the peculiar mode of action of the perineal band, avoiding, as it does, pressure upon the front of the groin, diminishes still further this danger. For a description of the mode of constructing properly a perineal band, I will refer you to the excellent papers on "Fractures of the Lower Extremities," by Reynell Coates, of Philadelphia, published in the 20th vol. of the *Amer. Journ. of Med. Sci.*

Following the suggestion made by Dr. Neill,[2] who uses for the same purpose a Spanish windlass, I have had the foot-block of my splint so constructed as that counter-extension may be made at the same moment with the extension. The principle is the same as that applied in the ancient glossocomon described by most of the early surgical writers. The advantages of this method are that the counter-extension, as well as the extension, can be made slowly, steadily, and firmly; the patient cannot, if disposed to interfere with the dressings, loosen or disturb them; the limb is acted upon equally in each direction, and the rollers which secure the limb to the splint do not become drawn obliquely and disarranged by the daily attempts to increase or continue the extension. The danger only is, that, in the hands of inexperienced surgeons, too much force will be applied, and perineal ulcerations ensue. (See Pl. V. Fig. 1.)

With children I often employ only the simple splint figured in Pl. V. Fig. 2, yet if the little patient is restive and disposed to throw himself about the bed, I prefer the double splint shown in Fig. 3, to which is attached a screw of peculiar construction, called the "endless screw," Pl. VI. Figs. 1, 2, 3, 4, the pattern for which was sent to me by some gentleman in Boston, whose name, I regret to say, I cannot now recall.

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[1] For cases of sloughing, &c., from perineal band, see N. Y. Journ. of Med., vol. xvi., 2d ser., p. 261; also same journal, vol. ii., 1st ser., p. 239.

[2] Philadelphia Med. Exam., vol. xi. p. 579.

In all cases one should prefer to use side splints, carefully fitted; the whole, both side and long splints, to be applied to the limb over neatly made cotton pads or junks, of which there ought to be laid upon every part of the leg and thigh as many as may be necessary to prevent unequal pressure.

To this general plan of treatment now recommended for fractures of the femur, the writer makes no exceptions, unless it be in the case of a fracture of the neck of the femur, occurring in old persons, or in fractures just above the condyles, where the direction of the fracture is obliquely downwards and forwards; in the former of which no rule can be adopted, except that the patient should be placed usually in that position which may be found most comfortable; and in the latter of which, the flexed position seems, indeed, the most rational, yet, according to the evidences furnished by Malgaigne, its advantages over the straight position are far from being established. In fractures occurring just below the trochanter minor, my own experience agrees with that of the distinguished author just quoted, that the straight position is still the best; an experience which seems to me also to admit of a satisfactory explanation. It is not directly upwards, but rather outwards and upwards, that the lower end of the proximal fragment is thrown by the action of the psoas magnus and iliacus internus, so that in order to meet the supposed indication it will be necessary to carry the lower part of the limb outwards also, a position which would certainly be found very inconvenient, if not actually impracticable in the majority of cases.

Nor can the tendency of the upper fragment to rise, and consequently to separate from the lower, be effectually met by posture alone, unless the thigh is completely flexed upon the body, a position again which will be found inconvenient, if not impossible.

It is apparent, therefore, that by posture alone we can only very imperfectly accomplish an approximation of the fragments; while we have almost entirely, whatever may be said to the contrary, deprived ourselves of all means of extension and counter-extension. On the other hand, admitting that by the straight position we have momentarily provoked a resistance which flexion of the limb might have prevented, we have, at the same time, slowly, but permanently, overcome this resistance by steady extension. In the one case, we have made a present gain, but a final loss; and in the other, a present loss results in our final gain. So it is that experience has shown in more than one case which has come under our observation, that although for a few moments, or perhaps for several hours after the straight position has been assumed in these fractures, the upper fragment will rise spasmodically, after a time, longer or shorter, and especially after the application of the side splints and bandages, this tendency will cease altogether.

My convictions upon this subject are clear, but since they do not correspond with the convictions of a pretty large proportion of practical surgeons, I am compelled to regard the question of posture in this fracture as still open. I will take the liberty to suggest, however, that it is by the results of carefully recorded experience alone that it can ever be determined, and not by any reference to physiological or anatomical arguments; which I suspect have had hitherto much more influence with surgeons in respect to this question than personal observation.

Note.—For an ingenious mode of dressing *compound* fractures of the thigh or leg, see apparatus invented by A. Hays, of Madison, Ind., in *Trans. of Amer. Med. Assoc.*, vol. iii. p. 382.

CHAPTER XV.

FRACTURES OF THE PATELLA.

CASE 1. *Simple fracture. Perfect bony union.*

Charles Jones, æt. 5, fell on his left knee, Jan. 31, 1848, breaking off a small fragment from the upper and inner margin of the patella. It did not separate from the lower fragment, except that when the knee was bent it was thrown directly forwards, presenting to the finger a sharp point.

Dr. Flint and myself in attendance. We directed the lad to keep his leg straight, and to apply cool water dressings.

Six months from this no traces of the accident remained.

CASE 2. *Simple transverse fracture. Ligamentous union.*

Edward Laffy, æt. 20, fractured the right patella transversely, Oct. 24, 1851. Dr. Shaw, of Silver Creek, N. Y., dressed the limb with a roller extending from the toes to the knee, and with Sir Astley Cooper's patella apparatus.

He was admitted to the Buffalo Hospital, Nov. 1, 1851, and, with slight modifications, the same dressings were continued until Nov. 26. I then removed the bandage and substituted my own splint, with adhesive plasters.

Dec. 5, I removed the splint and roller from the leg.

The fragments united by ligament; but the ligament was not more than one-quarter of an inch in length.

Case 3. *Simple transverse fracture. Union by ligament.*

John Delaney, æt. 36, fell, March 7, 1851, about fifteen feet, striking on his head and knee, and breaking the patella transversely.

March 21, he was admitted to the hospital. I immediately applied my own patella splint, securing the foot to the foot-board with a paste gaiter, and supporting the fragments in place with a paste knee-cap.

The fragments united by ligament, being separated from each other about one-quarter of an inch.

Case 4. *Simple fracture. Union by ligament.*

An Irish laborer, aged about 25 years, fractured the patella transversely, by falling over a dry-goods box while running at full speed. Dr. Mixer in attendance.

He was placed upon my splint—a single-inclined plane—and the patella retained in place by a strap instead of rollers.

At the request of Dr. Mixer, I saw him occasionally during the treatment.

Four months after the injury, the functions of the limb were completely restored, union of the fragments having been effected with a fibro-ligamentous tissue half an inch in length.

Case 5. *Simple fracture. Union by ligament.*

Theophilus Alles, æt. 56, fell on the side-walk, Aug. 27, 1854, breaking the patella of the left leg. Fracture transverse and simple.

The surgeon who was employed, applied only bandages to the leg and knee. No splint was used.

Sept. 10, 1854, two weeks after the fracture occurred, he was received into the Buffalo Hospital, and the same treatment was continued.

Oct. 1, 1854, when I took charge of the wards, I found the fragments united by ligament, but separated half an inch. On the 6th, I removed all dressings.

CASE 6. *Simple transverse fracture. Union by ligament.*

James McCuen, æt. 33, fractured the left patella transversely. Dr. Mixer and myself in attendance. The splint and the other dressings were continued three weeks and three days.

After two years, I find the patella united by a ligament of half an inch in length. The limb is not quite as strong as the other.

CASE 7. *Simple transverse fracture, from muscular action. Union by ligament.*

Oct. 21, 1846, a sailor, aged about 30 years, was walking across the floor, when his heel caught in a knot-hole and threw him backwards, breaking the patella transversely. The fracture was the result of muscular action alone.

I took charge of the case, at the request of Dr. Flint, on the third or fourth day. We applied my patella splint in the usual manner.

In four weeks ligamentous union was accomplished, with a separation of the fragments to the distance of half an inch.

CASE 8. *Simple transverse fracture. Union by ligament. Abundant callus. Partial rupture of ligament.*

Wheeler, æt. 40, fractured the patella transversely. Fracture treated by Dr. Williams.

Nine weeks after the fracture occurred, I examined the knee. The patella was surrounded with bony callus, so that it was considerably wider than the other. The fragments seemed to be united by a short ligament, except on the inner side, where there was a separation or rupture of the ligament, to the extent of one-quarter of an inch. The patient explains this, by saying that the splint was removed at the end of four weeks, and that after a week more he began to walk, but that he almost immediately felt it tear or give way on the inner side.

CASES 9 AND 10. *Simple fracture of both patellas. Union by ligament.*

John Dundas, æt. 22, fell, Oct. 22, 1852, in the night, while asleep, from a window in the third story of a dwelling-house, striking with his knees upon the stone side-walk.

He was seen by Dr. Pratt, and Gibson's long thigh-splints were applied.

On the tenth day I took charge of him, at the Buffalo Hospital, and substituted my simple-inclined plane for the Gibson splint. I covered each leg from the toes upward, as far as the knee, with a paste bandage, and then, having properly cushioned the limbs, I secured the fragments in place with adhesive plaster.

Nov. 28, 1852, thirty-seven days after the fractures occurred, all dressings were removed. Both patellas had united by ligaments of about one-quarter of an inch in length.

CASE 11. *Simple transverse fracture. Occurring twice at the same point. Union by ligament.*

Carl Abend, æt. 30, fractured his left patella, Dec. 4, 1850, and again, Feb. 3, 1851.

He was admitted to the Buffalo Hospital of the Sisters of Charity, Feb. 6, 1851. The fracture was transverse, and the fragments were separated one inch. The whole limb was swollen, and as the splint had now been on the limb a great portion of the time since the first fracture, I had it removed altogether, and directed the limb to be bathed twice, daily, with cold water. This treatment was continued ten days. I then applied my own splint.

March 21, six weeks from the date of the last fracture, I removed all dressings, and found the fragments united by a ligament of one-quarter of an inch in length. (See cast in my cabinet.)

CASE 12. *Simple fracture. No union of the fragments.*

John Sharkie, æt. 24, a soldier in the British service, while serving in the East Indies, was struck on the right knee while he was in a sitting posture, with his leg bent under him.

He was immediately placed under the charge of the surgeon of the 89th Regiment of Infantry. During the first eleven days, no splints or bandages were applied, on account of the severe inflammation and swelling. A compress was then placed over both fragments, and they were bound together by rollers, &c. The whole limb was suspended on an inclined plane, the foot being made fast to a foot-board. This treatment was continued four months. When the bandages were removed, the limb was badly swollen. Immediately on removing the bandages, the upper fragments drew up towards the body. It was eighteen months before he could walk, even with the aid of a cane.

March 27, 1855, twenty-nine years after the injury was received, he was an inmate of the Buffalo Hospital, and I was permitted to examine his knee carefully.

The lower fragment is not displaced, but when the leg is straight upon the thigh, the upper fragment lies two and a half inches from the lower, and when it is flexed upon the thigh, the upper fragment is removed five inches from the lower. There is no ligament or other bond of union, so far as I can discover. He walks with very little or no halt, but he cannot walk fast.

CASE 13. *Comminuted fracture, complicated with fracture of the femur. Result imperfect.*

Dec. 27, 1853, Wm. Palmerston, of Black Rock, Erie Co., N. Y., about 25 years old, fell, and broke both his left thigh and patella. (See Case 70 of "fractures of femur.") The patella was broken, transversely, near its middle. There was also a longitudinal fracture near the inner margin.

Drs. Lewis and Dayton were in attendance. I was requested by these gentlemen to see the case on the fifth day. The femur being broken, also, our treatment was, in consequence, somewhat modified. A single straight splint was employed, and adhesive straps were laid over the patella.

On the fifty-eighth day, the splint was not yet removed from his knee, but the fragments were united.

June 3, 1854, five months after the fracture occurred, I found the fragments separated half an inch, but united by what felt like bone. There was a small loose fragment on one side, and which occasionally produced pain and swelling at that point. He had but little motion in the knee-joint, yet he was able to walk and to pursue his trade, as a carpenter, without much inconvenience.

PATELLA.

No.	Age when it occurred.	Time since it occurred.	Sex.	Right or left side.	Character of fractures.	TREATMENT.	RESULT.				
							United or not.	When united.	By bone or ligament.	Remarks.	Perfect or imperfect.
1	5 y.	6 m.	M.	L.	Simple, oblique.	Straight positions.	U.		B.		P.
2	20 y.	6 w.	M.	R.	Simple, transverse.	A. Cooper's apparatus, &c.	U.	6 w.	L.	Ligame't ¼ inch in length.	Imp.
3	36 y.		M.		Simple, transverse.	My own apparatus.	U.		L.	Ligame't ¼ inch in length.	Imp.
4	25 y.		M.		Simple, transverse.	My own apparatus.	U.		L.	Ligame't ⅛ inch in length.	Imp.
5	36 y.	5 w.	M.	L.	Simple, transverse.	Only bandages.	U.	5 w.	L.	Ligame't ⅛ inch in length.	Imp.
6	33 y.	2 y.	M.	L.	Simple, transverse.		U.	24 d.	L.	Ligame't ½ inch in length; limb not quite as strong as the other.	Imp.
7	30 y.	4 w.	M.		Simple, transverse by muscular action.	My own apparatus.	U.	4 w.	L.	Ligature ⅛ inch in length.	Imp.
8	40 y.	9 w.	M.		Simple, transverse, &c.		U.	4 w.	L.	Ligament partially torn at end of 4 weeks; much callus; ligament ¼ inch in length.	Imp.
9	22 y.	6 w.	M.	R.	Simple, transverse.	My own apparatus.	U.	37 d.	L.	Ligame't ½ inch in length.	Imp.
10	"	"	"	L.	" "	" "	"	"	"	" "	"
11	30 y.	4 m.	M.	L.	Simple, transverse.		U.	2 m.	L.		Imp.
"	"	2 m.	"	"	" "	My own apparatus.	U.	6 w.	L.	This was a fracture at the second point, 4 weeks after the first; it united by ligament ¼ inch in length.	Imp.
12	24 y.	29 y.	M.	R.	Simple, transverse.	Single inclined plane, &c., continued 4 mos.	Not U.			Was not able to walk with a cane under 18 months; fragments separated from 2½ to 5 in., according to position of leg; walks tolerably well.	
13	25 y.	5 m	M	L.	Comminuted, complicated.	Straight splint, &c.	U.	58 d.	B.	Main fragments separated ¼ inch by what feels like bone; small fragments loose; knee-joint stiff.	Imp.

ANALYSIS.

Of 13 fractures of the patella, 12 were the results of direct blows or falls upon the knee, and 1 (Case 7) was the result of muscular action alone.[1] 11 were simple, and transverse; Case 1 was a simple oblique fracture, extending only across one corner of the bone, and Case 13 was broken both transversely and longitudinally. Cases 9 and 10 were in the opposite limbs of the same person, and Case

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[1] Dr. Kirkbride, of Philadelphia, has reported three cases of fracture of this bone, from muscular action; two of the cases having occurred in the opposite limbs of the same person. *Amer. Journ. of Med. Sciences*, vol. xvi. p. 330. And Dr. Hayward has reported another in vol. xxx. of the same journal, at p. 512.

red at the same point after two months. All were
corded as having occurred in the left leg, and 3 in
ages ranged from five years to fifty-six; of which 1
en, 7 were between fifteen and thirty-one, 3 were
and forty-six, and 1 was over forty-five.

All h ited except Case 12. Case 1 and Case 13 have
, it is believed, by bone; while the remaining 11 have united
ich in 6 cases was found to be about one-quarter of
h, and in 4 cases half an inch. The shortest period
was known to have taken place, was twenty-four
ongest period, fifty-eight days—the average being
days.

REMARKS.

Dr. Kirkbride has reported a case of ligamentous union of the patella, in which the ligament was two and a half inches long, and was attached only to the inner margins of the fracture. "He was able to walk as rapidly as ever, and without perceptible limping."[1] A similar case is reported by Dr. Watson, of New York, in which the fragments became separated three and a half inches.[2] In both instances, the fragments seemed to have united by a short ligament, which had become lengthened by premature use of the limb; in the case reported by Kirkbride, the ligament seemed to have partly torn, as in Case 8, reported by myself. Dr. Coale presented to the Boston Society for Medical Improvement, at its April meeting in 1856, a specimen of a fractured patella taken from a man sixty-five years old; the fracture having occurred ten years before. The fragments were at first so closely united that no division between them could be discovered, but now they are separated at their outer edges one inch, and at their inner edges one-eighth of an inch.[3]

Post, of New York, has reported three cases of compound fracture of the patella extending into the knee-joint, brought to a successful termination.[4]

In a case mentioned by Dr. Eve, of Augusta, occasioned by the kick of a horse, and in which amputation became necessary on the tenth day, "the knee-joint was found filled with dark grumous blood, a portion of the cartilage of the internal condyle of the os femoris was chipped off, and the patella broken into a number of fragments."[1]

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[1] Amer. Journ. of Med. Sciences, vol. xvi. p. 32.

[2] N. Y. Journ. of Med. and Surgery, vol. iii. (first series) p. 366.

[3] Boston Med. and Surg. Journal, vol. liv. p. 402.

[4] New York Journ. of Med., vol. ii., 1st series, p. 367.

TREATMENT.

Dr. Sanborne, of Lowell, Mass., has invented an ingenious mode of treating transverse fractures of the patella, and also cases of rupture of the ligamentum patellæ, which I shall take the liberty of describing in his own language.

"CASE.—While repairing one of the public buildings of this city, two men, masons by trade, were precipitated, by the breaking of a staging, a distance of twenty-five feet on to a plank floor. One of the men received a fracture of the base of the skull, and died in consequence; the other escaped with a rupture of the ligamentum patellæ. The man was conveyed home, and a neighboring physician applied the usual dressing of a 'figure of eight' bandage, with a splint behind the joint. In the course of the following night, the pain in the knee became intolerable, from the swelling and consequent tightness of the bandage, and all dressings were removed. The following day the case was transferred to my care by the attending physician. I found the knee a good deal swollen and inflamed, and there was evidence of extensive extravasation of blood into the joint and surrounding tissue. The patella was drawn up the thigh for a distance of four inches; and although it could be brought down nearly to its proper situation by the hand, a bandage sufficiently tight to keep it there could not be borne. The object to be accomplished, then, was to bring a sufficient force to bear on the patella, without making pressure on the joint or impeding the circulation of the limb. And it was accomplished in this manner: a strip of ordinary adhesive plaster, four feet long and two and a half inches wide, was applied to the limb from the upper portion of the thigh to the middle of the leg, leaving at the knee a free loop * * * *. (See Figs. 2, 3, Pl. XIV., appendix.) A roller bandage was then applied above and below the knee, for the purpose of securing the plaster, and controlling the circulation and muscular contraction. A small stick, six or eight inches in length, then being put through the loop over the knee, the plaster was twisted until the patella was brought nearly down to its proper situation. Before applying the *twist*, a hand compress was placed above the edge of the patella in such a manner as to bring the force to bear directly upon that bone. * * * * Leeches and fomentations were applied to the joint; and as the inflammation subsided, the plaster was tightened, until (at about the sixth day) the bone was brought fully down to its normal situation. It was there held, without the slightest uneasiness to the patient, until union took place. In three weeks the man was able to walk alone, with the plaster still applied, and the recovery was ultimately perfect. There is now no perceptible halt in the gait.

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[1] Southern Med. and Surg. Journ., 1848; also Bost. M. J., vol. xxxvii. p. 427.

"Within the last two years several cases of transverse fracture of the patella have been treated by this method, both by myself and others in this vicinity, and with perfect success. In the winter of 1854 I also had the pleasure of applying this dressing to a patient of Mr. Stanley's in St. Bartholomew's Hospital, London, when the simple inclined plane failed to bring the two fragments of the fractured patella together. The simplicity of the method, and its complete success, gained for it the warm approval of that distinguished surgeon."[1]

The dressing which I have usually employed in the treatment of this fracture, consists of a single inclined plane, of sufficient length to support the thigh and leg, and about six inches wider than the limb at the knee. This plane rises from a horizontal floor of the same length and breadth, and is supported at its lower end by an upright piece of board, which serves both to lift the plane and to support and steady the foot. The lower end of the inclined plane may be elevated from six to eighteen inches, according to the length of the limb and other circumstances. Upon either side, about four inches below the knee, is cut a deep notch. The foot-piece stands at right angles with the inclined plane, and not at right angles with the horizontal floor; it may be perforated with holes for the passage of tapes or bandages to secure the foot.

Having covered the apparatus with a thick and soft cushion, carefully adapted to all the irregularities of the thigh and leg, especial care being taken to fill completely the space under the knee, the whole limb is now laid upon it, and the foot secured gently to the foot-board, between which and the foot another cushion is placed.

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[1] Bost. Med. and Surg. Journ., vol. liv. p. 174.

The body of the patient should also be flexed upon the thigh, so as the more effectually to flex the quadriceps femoris.

A compress made of folded cotton cloth, wide enough to cover the whole of the breadth of the knee, and long enough to extend from a point four inches above the patella to the tuberosity of the tibia, and one-quarter of an inch thick, is now placed on the front of, and above the knee. While an assistant presses down the upper fragment of the patella, the surgeon proceeds to secure it in place with bands of adhesive plaster. Each band should be two or two and a half inches wide, and sufficiently long to inclose the limb and splint obliquely. The centre of the first band is laid upon the compress partly above and partly upon the upper fragment, and its extremities are brought down so as to pass through the two notches on the side of the splint and close upon each other underneath. The second band, imbricating the first, descends a little lower upon the patella and is secured below in the same manner. The third, and so on successively until the whole extent of the compress and knee is covered, is carried more nearly at right angles around the limb and splint; the last bands passing obliquely from below upwards and backwards. The dressing is now completed by passing a cotton roller around the whole length of the limb and splint, commencing at the toes and ending at the groin. This is to be applied lightly, as its object is only to support and steady the limb upon the splint. (Fig. 4, Pl. XIV.)

The great advantage which this mode of dressing possesses, is that it does not ligate the limb completely; since, on either side, between the broad margins of the splint and the points where the straps and bandages touch the limb, there is a space, more or less considerable, against which no pressure is made, and through which the circulation may go on without impediment; so that however firmly the bands are drawn across the knee, no swelling occurs in the foot. As to its efficiency, the best testimony which can be presented, is the simple fact, that of the six cases reported as having been treated by this method, four have united by a ligament of one-quarter of an inch in length, and two by a ligament of half an inch.

The plan adopted by M. Gama, of Val de Grace,[1] is similar to that which I have now described, but the splint upon which the limb reposes is not so wide; while width is an essential point in the attainment of the objects which I propose. Dr. Neill, of Philadelphia, uses also the adhesive plaster straps, but they are not placed outside of the splint.[1] Such also I understand to be Mr. Alcock's method of using the adhesive plaster.[2]

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[1] Malg., Traité des Fractures, etc., op. cit., p. 764.

CHAPTER XVI.

TIBIA.

Upper Third.

CASE 1. *Simple transverse fracture. Result perfect.*

Mrs. W., of Buffalo, æt. 58, fell, Oct. 19, 1848, striking on her right knee, breaking the tibia just below the tuberosity. Fracture transverse. The fall was the result of a misstep on level ground, and was attended with only slight bruising of the soft parts. She says, that on attempting to rise she discovered what had happened, the bone projecting very distinctly, and she pushed and pulled it into place with her own hands.

Dr. Barnes, who was the family physician, requested me to see it on the same day. Mrs. W. was large, with a leucophlegmatic temperament. The limb was already swollen and œdematous. The fragments were in place, but motion and crepitus were distinct.

We dressed the limb by laying it on a pillow, and supporting it with two lateral splints placed outside of the pillow, and confined the limb to the pillow with tapes. About one week from this, we laid the limb over a double inclined plane. The fragments united promptly and without the slightest amount of displacement or deformity, or ensheathing callus. In six weeks all dressings were discontinued.

The neck of the femur of the same limb was broken in 1841. (See Case 16 of "fractures of femur.")

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[1] Philadelphia Med. Examiner, vol. x. p. 1.

[2] Practical Observ. on Frac. of the Patella and of the Olecranon, by Thomas Alcock, p. 296.

Case 2. *Simple transverse fracture. Result perfect.*

Peter Hamil, of Buffalo, æt. 29, was admitted to the hospital, Aug. 31, 1849, with an injury to his left leg, which had occurred two days before. A young surgeon in the city had examined the limb, and thought the femur was broken just above the joint. He had applied a roller from the toes to the thigh; and to the thigh were applied, very nicely adjusted, lateral splints. These dressings were on the limb at the time of his admission, and were not removed until the next day. I could not then discover any fracture or displacement, and the dressings were discontinued, the limb being merely laid upon pillows. After about eight days, however, when the swelling of the foot, consequent upon the bandaging, had subsided, I reapplied side splints, believing it possible that I might have overlooked a transverse fracture of the lower end of the femur. On the 26th of Sept., I discontinued them altogether.

Oct. 4, when examining the limb, I found a slipping sensation, like that produced in a false joint, through the upper end of the tibia, and I now easily understood what had been mistaken for a fracture of the femur. It was a transverse fracture through the upper end of the tibia, and without displacement. Union was delayed, perhaps owing to its not having been at all supported by splints. The knee-joint was quite stiff. No splints were afterwards applied; and on the 25th of Nov., three months after admission, he was dismissed, the motion between the fragments having ceased, but the knee still remaining quite stiff.

Case 3. *Simple fracture. Result perfect.*

James Ellis, æt. 42, broke the tibia about two or three inches below its articulating surface. It was treated by a surgeon at Port Sarnia, C. W.

Ten weeks after the accident, he called upon me, and I found the bone united, but some bent at the seat of fracture. In all other respects it was perfect.

Case 4. *Simple fracture. Result perfect.*

John G. Zimmerman, a citizen of Saxony, in Germany. When eight years old, he fractured the left tibia, about three inches below the knee. The fracture was examined by two surgeons, both of whom pronounced it a fracture. The fragments were movable. They applied lateral splints and bandages.

March 31, 1854, while Zimmerman was an inmate of the Buffalo Hospital, and thirty-seven years after the accident, I examined the limb, and found no traces of a fracture.

CASE 5. *Simple fracture, with displacement of head of fibula. Result imperfect.*

Robert Purcell, of Attica, N. Y., æt. 55, broke the tibia, about three inches from the knee-joint; at the same time displacing the upper end of the fibula upwards.

Dr. C., of Attica, N. Y., was employed.

Two years after the accident, I found the limb shortened one-quarter of an inch; the tibia slightly bent at the seat of fracture; the head of the fibula remaining displaced, and the limb painful when he walked much.

The same leg was broken in its middle, two years before. (See Case 14 of "fractures of tibia.")

Middle Third.

CASE 6. *Simple transverse fracture. Result perfect.*

July 6, 1849, Mrs. Lathan, of Buffalo, æt. 50, broke the left tibia near its middle. Fracture transverse, and never displaced. I dressed the limb, at first temporarily, and on the fifth day I applied a starch bandage. At the end of two months, union was complete and without displacement.

CASE 7. *Simple fracture. Result perfect.*

R. Jackson, of Buffalo, æt. 46, broke the tibia near its middle. Does not know the name of the surgeon who dressed the fracture.

Ten months after, the limb was of the same length with the other, but there was a slight forward bend at the seat of fracture, and the limb still pained him occasionally.

CASE 8. *Simple transverse fracture. Result perfect.*

George Peterson, of Buffalo, æt. 11, fractured his right tibia near its middle, June 25, 1850, by falling from a building, twenty feet. Fracture transverse, and fragments not displaced. Very large thrombus. I laid the limb simply on a pillow, until the sixth day, when I applied a paste roller. On the twenty-fifth day after the fracture, I dismissed him with a perfect cure.

Six years after, the limb was perfect.

CASE 9. *Simple fracture. Result perfect.*

George Eggleston, æt. 17, fractured the right tibia near its middle. The fracture was treated by Dr. Blair, of Rome, N. Y.

Eleven years after, when examined by myself, the limb was sound and perfect.

CASE 10. *Simple fracture. Result perfect.*

Michael Hollis, æt. 30, fractured the tibia of his left leg near its middle. Dr. Crandell, of Palmyra, treated the fracture.

Four years after, when examined by myself, the limb was perfect.

CASE 11. *Simple fracture. Result perfect.*

Wilhelm Hansikom, æt. 24, broke the tibia near the lower end of the middle third. It was dressed by Dr. Walter, of New Brandenburg, Germany. A large number of narrow splints were placed around the limb.

Jan. 8, 1856, thirty years after the accident, and while he was an inmate of the Buffalo Hospital, I examined the leg. It was in every respect perfect.

CASE 12. *Simple fracture. Result perfect.*

Harrison Webster, æt. 17, broke the tibia near its middle. Dr. Needham, of Onondaga, N. Y., treated the fracture.

Four years after the accident, the limb was perfect.

CASE 13. *Simple fracture. Result perfect.*

Jeremiah Torrey, æt. 11, broke the right tibia through its middle. Surgeon Day, of England, treated the fracture.

After sixteen years, I found the limb sound and without deformity.

CASE 14. *Compound fracture. Result perfect.*

Robert Purcell, æt. 53, fractured the tibia through the lower third. Dr. Curtis, of Attica, N. Y., was employed.

Four years after the fracture occurred, I found no traces of the fracture.

CASE 15. *Compound fracture. Result imperfect.*

Hugh Boyle, of Toronto, C. W., æt. 26. Fracture of the right tibia, near its middle. Dr. W., of Toronto, took charge of the limb.

Nine years after, he became an inmate of the Buffalo Hospital, on account of an ulcer which had existed over the seat of fracture ever since the accident occurred.

CASE 16. *Compound fracture. Result imperfect.*

John Mahan, æt. 39. Admitted to the Buffalo Hospital, Feb. 16, 1853, with a compound fracture of the right tibia, near the middle of the leg. The bone was broken by the kick of a Dutchman. I found the limb much swollen, and very painful, and I laid it carefully over a double inclined plane, and directed cold water irrigations; I also directed morphine in full doses. The inflammation, for several days, threatened the complete loss of his limb. On the tenth day, the lower end of the upper fragment was projecting in front of the lower fragment, and I covered the angle of the splint, and made moderate pressure upon the upper fragment. On the twentieth day, the fragments were bent backwards, and I placed a compress behind. On the thirty-seventh day, we took the limb from the inclined plane, and trusted alone to side splints. On the forty-fifth day, we removed all dressings. Bone not united. Laid the limb simply on a pillow. After six days, I applied a movable gutta percha splint. Directed the limb to be bathed and rubbed every day, and allowed patient to sit up. Fifty-ninth day, he began to walk on crutches. Motion between fragments still continued. On the ninety-third day, I found a firm union, without ensheathing callus. The upper fragment is slightly in front of the lower.

CASE 17. *Compound, comminuted fracture. Result imperfect.*

Simon Cone, of Buffalo, æt. 28, broke his tibia through its middle third. Dr. H. was employed.

Seven months after the accident occurred, I removed a small fragment which had never united to the shaft. The wound had closed over, and for a long time this fragment could be felt moving under the skin, but not causing inflammation or suppuration, yet the skin over it was tender, and he wished it removed.

The leg was shortened one-quarter of an inch. I did not, however, detect any displacement of the fibula, yet it must have existed.

Lower Third.—Malleolus.

CASE 18. *Compound fracture, complicated with fracture of astragalus. Result imperfect.*

Pat. Murphy, æt. 28, admitted to the Hospital of the Sisters of *Charity*, Oct. 22, 1848.

"Three weeks since, his right foot was traversed by the wheel of an empty car, and badly crushed. Until received here, he had been under the care of Dr. W. of this city; and the swelling, at first very great, had been considerably reduced, and the wounds partially healed. Crepitus was distinct upon slight motion of the foot. A gutta percha splint was applied to the leg and foot, with also simple dressings to the wounds, and the whole limb was placed in a Bowen's splint.

"From this date until the 31st, the discharge of matter was profuse, and often highly offensive. He suffered much from pain and general restlessness. Night-sweats and occasional chills, also with emaciation, indicated an approach to hectic. The treatment was chiefly tonic and stimulating. Under this plan, with careful dressing and management of the leg, he gradually passed the crisis, and from about the 31st of October, more than four weeks after the accident, he slowly improved. Several fragments of bone were discharged, but when dismissed, Dec. 12th, he had tolerably free use of his ankle-joint, the wounds had healed, and he had a very useful, but not perfect limb.

"We never absolutely condemned this limb to amputation, yet, at one time, we warned him of the probability that it would soon be necessary to make this sacrifice for the safety of his life."

Lower Third.—Above Malleolus.

CASE 19. *Simple fracture. Result perfect.*

James McDonald, of Buffalo, æt. 33, fractured the right tibia about two inches above the ankle-joint. It was treated by Dr. Austin Flint, of Buffalo.

Three years afterwards, I could find no trace of the accident.

CASE 20. *Compound fracture.* (*A gunshot wound.*) *Result imperfect.*

John Thurstone, æt. 17, was shot in the left leg, breaking the tibia about two or three inches above the ankle-joint. Dr. Amasa Trowbridge, of Watertown, N. Y., was employed.

Six years after, I found the bone united with some deformity, but not shortened.

TIBIA.

							RESULT.				
				Right or	haracter of fractures.	TREATMENT.	United or not.	When united.	Amount of shortening.	Remarks.	Perfect or Imperfect.
					UPPER THIRD.						
					mple, trans- erse.	Lateral splints, pillows, &c.	U.				P.
					mple, trans- erse.	Lateral splints.	U.	3 m.		Knee stiff.	P.
					mple.		U.			Slight bend.	P.
					mple.	Lateral splints.	U.				P.
					mple with		U.		¼ in.	Slight bend; fibula displaced.	Imp.
					MIDDLE THIRD.						
6	50 y.	2 m.	F.	L.	Simple, transverse.	Starch bandage.	U.	2 m.			P.
7	46 y.	10 m.	M.		Simple.		U.			Slight forward bend at seat of fracture.	P.
8	11 y.	6 y.	M.	R.	Simple, transverse.	Paste bandage.	U.				P.
	11 y.		M.	R.	Simple.		U.				P.
	4 y.		M.	L.	Simple.		U.				P.
	30 y.		M.		Simple.	Lateral splints.	U.				P.
	4 y.		M.		Simple.		U.				P.
	16 y.		M.	R.	Simple.		U.				P.
	4 y.		M.		Simple.		U.				P.
	9 y.		M.	R.	Compound.		U.			Ulcer over seat of frac.	Imp.
	99 d.		M.	R.	Compound.	Double inclined plane, &c. &c.	U.	abt. 80 d.		Upper fragment a little in front of lower.	Imp.
17	28 y.	7 m.	M.		Compound, comminuted.		U.		½ in.	Removed a loose fragment after 7 months.	Imp
					LOWER THIRD (MALLEOLUS).						
18	28 y	10 w.	M.	R.	Compound, complicated.	Bowen's splint, &c. &c.	U.			Several fragments of bone discharged.	Imp.
					LOWER THIRD (ABOVE MALLEOLUS).						
19	33 y.	3 y.	M.	R.	Simple.		U.				P.
20	17 y.	6 y.	M.	L.	Compound.		U.			Slight deformity.	Imp

ANALYSIS.

Of 20 fractures of the tibia, 5 belong to the upper third, 17 to the middle third, and 3 to the lower third: of which latter, 1 was a fracture of the malleolus. Of the whole number, 15 were simple, and 5 more or less complicated. Of these simple fractures, 4 were known to be transverse. 2 of the transverse fractures occurred in the upper third, and 2 in the middle third; so that the transverse fractures in the upper third stand in the proportion of two to five, and in the middle third, of two to seventeen. All of the simple fractures are recorded as perfect: and all of those having complications, as imperfect. A shortening of one-quarter of an inch occurred in but two instances, in both of which the fibula is believed to have been slightly displaced at one of its articulations. A slight forward inclination of the lower end of the upper fragment is mentioned twice; and in three other cases a slight deviation of the line of the bone is mentioned, but its direction is not noticed. Twice fragments of bone exfoliated, or were removed, and once an ulcer had existed over the point of fracture nine years.

18 were males, and 2 females. 8 are known to have occurred in the right leg, and 5 in the left.

The treatment has generally consisted in the application of light lateral splints, with simple dressings.

It scarcely seems necessary, where the principles of treatment are so obvious, and the results are almost always so satisfactory, to make any suggestions as to the proper modes of dressing: and especially since, whatever difficulties may present themselves, they are not so peculiar but that the remarks we shall hereafter have occasion to make on the subject of fractures of both bones of the leg, will equally apply to these cases.

CHAPTER XVII.

FIBULA.

(I have no cases of fracture of the upper third to report.)

Middle Third.

CASE 1. *Simple fracture, with dislocation of tibia inwards. Result imperfect.*

J. L. B., of Utica, æt. 12; by the kick of a horse his left tibia was dislocated inwards, and the fibula broken five inches above its lower end. Dr. F., of Cazenovia, reduced the bones.

After two years, the tibia remains slightly displaced inwards, and the fibula rests against the tibia at the seat of fracture. The motions of the limb are unimpaired, and its usefulness in no way diminished.

CASE 2. *Compound fracture, with dislocation of tibia inwards. Result nearly perfect.*

Robert Campbell, æt. 20, fractured the fibula of his left leg near its middle. Fracture compound, and complicated with an inward dislocation of the tibia. Dr. Wilson, of Providence, R. I., was employed.

Five years after the injury was received, I found the limb sound, and nearly perfect.

CASE 3. *Compound fracture, with dislocation of tibia inwards. Result perfect.*

Harrington Whiton, æt. 14, fractured the left fibula near its middle. The tibia was at the same time partially dislocated inwards.

Twenty-eight years after, I could not discover any trace of the injury.

Lower Third.

CASE 4. *Simple fracture. Result perfect.*

E. T. Bacchus, æt. 40, broke left fibula near the ankle, Dec. 7, 1836. Mr. B. is a farmer, and was, at the time of the accident, in excellent health. He was walking upon an icy side-walk, when his foot slipped, and he fell, breaking his leg by the fall.

I applied within an hour, Dupuytren's splint along the inside of his leg, and sent him home.

Six months after, his limb was sound and without deformity.

CASE 5. *Simple fracture. Result perfect.*

Robert Purcell, of Attica, æt. 57, fell from a scaffolding and fractured the fibula, about two inches above the ankle. Dr. Curtis, of Attica, in attendance. Active inflammation followed.

Four weeks after the accident, he called upon me, and I found the bone firmly united. I could not at this time detect any deformity, but Dr. Curtis has since informed me that he thinks a slight deformity ensued.

This gentleman has had one of his legs broken twice before, and in each instance the fractures were treated by Dr. Curtis, and united without deformity.

Case 6. *Simple fracture. Result perfect.*

Charles Billings, of Buffalo, æt. 34, fractured the left fibula, about three inches above its lower end. It was treated by Dr. Chapin, of Buffalo, N. Y.

Fourteen years after the accident, the limb was perfect.

Case 7. *Simple fracture. Result perfect.*

Isaac Stafford, æt. 34, broke the left fibula, in its lower third. Dr. Low, of Guilderland, N. Y., dressed the limb.

Twenty-four years after the accident, I could not detect any traces of the fracture.

Case 8. *Simple fracture. Result perfect.*

Frank Whalin, æt. 26, fell from a scaffolding, July 29, 1853, breaking the right fibula, three inches above the ankle. I applied Dupuytren's splint, secured with a starch bandage.

He died in May, 1854, and at this time the limb seemed perfect. He had walked for many months without any appearance of halt or lameness.

Case 9. *Simple fracture. Result perfect.*

Michael Schenlin, of Buffalo, æt. 25. Jan. 20, 1855, a heavy gate fell upon the outside of his left leg, breaking the fibula, three and a half inches above the ankle. No surgeon was called until the 23d, three days after the accident. The limb was then much swollen. I could not feel the fibula sufficiently to determine whether the fragments were displaced, but crepitus was distinct.

I directed no applications, except cold water irrigations. On the seventh day, the swelling had subsided. Fragments in line, but not united.

This patient recovered in about six weeks, without either lameness or deformity.

Case 10. *Simple fracture, with partial dislocation of tibia inwards. Result perfect.*

Mrs. Catharine Jordan, of Buffalo, aged 60 years. Mrs. J. fell on the side-walk, producing a partial dislocation inwards of the left tibia, and a fracture of the fibula.

The fracture of the fibula could not be felt, nor could I detect crepitus, but its existence was assumed, from the great degree of flexibility about the joint.

The tibia was easily restored to place, and the leg was dressed with Dupuytren's splint. Two months after the injury was received, it was firm and perfect.

CASE 11. *Simple fracture. Result imperfect.*

James Shepard, æt. 20, fractured the fibula of his right leg, about two inches above its lower end.

Dr. McBeth, of Erie Co., was employed.

Four years after, I found the foot slightly turned out, and there remained considerable bony enlargement around the seat of fracture. The fibula had united, bent inwards towards the tibia. The motions of the joint were free and perfect.

CASE 12. *Simple fracture. Result imperfect.*

John Sanford, of Schenectady, æt. 32, fractured his left fibula, about two inches above its lower end. Dr. Day, of Schenectady, was employed.

I examined the limb, twenty years after, and found some deformity remaining. It occasionally swells and becomes painful.

CASE 13. *Simple fracture, with dislocation of tibia inwards. Result nearly perfect.*

Charles Sauer, of Buffalo, aged about 30 years; while carrying a weight upon his shoulders, slipped upon the side-walk and fell, dislocating the left ankle, and fracturing the fibula four inches from its lower end. I was in attendance soon after the accident occurred, and reduced the dislocation by very moderate extension, made with my hands. The leg was flexed upon the thigh, while extension was made at the foot. We applied Dupuytren's splint. Only moderate inflammation followed, and the limb was free from all anchylosis six weeks after the injury was received.

About two years after, Aug. 2, 1856, I examined the limb, and found that the ankle-joint remained larger than the other, and that occasionally it became considerably swollen and somewhat painful. The malleolus internus does not project at all unnaturally, nor does the foot turn out. The fibula is united in perfect line, the fragments not inclining in either direction.

CASE 14. *Simple fracture, with dislocation of tibia inwards. Result imperfect.*

Jonathan Robinson, æt. 32, dislocated the lower end of the tibia inwards, breaking the fibula about two or three inches above the ankle.

Dr. H., of Lancaster, N. Y., reduced the dislocation and treated the fracture.

I examined the leg twelve weeks after, and found the tibia remaining slightly displaced inwards, and the fibula bent inwards, towards the tibia, at the seat of fracture. The ankle was much swollen.

CASE 15. *Simple fracture, with dislocation of tibia inwards. Result imperfect.*

—— Terry, of Mount Morris, aged about 35 years. The accident occurred in stepping forwards from a canal boat upon an irregular surface.

Dr. S., of Lockport, immediately reduced the bones and applied Dupuytren's splint. He subsequently came under my care in Buffalo. The inflammation consequent upon the injury soon made it necessary to remove the splint. He left me at the end of five weeks with the fracture united, and the swelling nearly dispersed, but with considerable stiffness in the joint, and with some slight projection of the malleolus internus.

CASE 16. *Simple fracture, and inward displacement of tibia. Result imperfect.*

Philip Carey, of Ireland, æt. 22, fell with his left leg under him, and in this situation another man fell upon him, breaking the fibula of this leg about three or four inches above the ankle-joint, and displacing the tibia inwards.

An Irish bonesetter reduced the dislocation, and treated the fracture. No splints were applied. He was confined to his bed six weeks.

Twenty years after this, while he was an inmate of the Buffalo Hospital, March 30, 1855, I examined the leg.

The fibula is united with the ends of the fragments displaced; the lower end of the upper fragment being behind the upper end of the lower. The motions of the ankle-joint are not free, and it is occasionally painful when too much exercised.

CASE 17. *Simple fracture of external malleolus, with partial inward displacement of tibia. Result imperfect.*

Abel Godard, of Dansville, æt. 21, partially dislocated the tibia inwards, fracturing also the malleolus externus. Dr. R., of Dansville, N. Y., was employed.

Eight months after the accident occurred, I found the tibia remaining slightly displaced, and the lower fragment of the fibula carried downwards.

Case 18. *Simple fracture, with partial outward displacement of tibia. Result imperfect.*

L. I. Barrows, of Utica, æt. 12, was kicked by a horse, breaking the radius of the left arm, and also at the same time the left fibula, four or five inches above the ankle. The tibia was also slightly displaced outwards.

Ten years after the accident, while he was a student of medicine, I examined the limb. The tibia still remained somewhat displaced outwards, and the fibula was bent in against the tibia at the seat of fracture. The functions of the limb were unimpaired.

Dr. F., of Cazenovia, was his surgical attendant.

Case 19. *Simple fracture of the fibula, complicated with a compound, consecutive dislocation of the tibia forwards. Result imperfect.*

Michael McLaughlin, aged 35 years, of Buffalo. A heavy bar of iron fell upon McLaughlin's instep, resulting in violent inflammation and a sloughing of all the structures in front of the ankle-joint. The fibula was broken near its lower end by the same accident.

Dr. P., of Buffalo, was employed, and treated the case with light splints, but with his attention directed chiefly to the prevention of inflammation. Fifteen days after the injury was received I saw the patient with Dr. P. No displacement of the bone had yet occurred. Subsequently he became an inmate of the hospital and remained under my care until he was dismissed.

When the slough separated, the tibia began gradually to abandon its socket and to slide forwards, and this notwithstanding our constant efforts to retain it in place. A small piece of the front and lower end of the tibia at length exfoliated, and from this time the closure of the wound advanced rapidly. We were now able by the careful application of dressings with compresses, to gradually return the bone to its place, and when the wound had completely healed, the tibia was again restored to position. About six months elapsed before the cure was complete. No deformity then remained, but the ankle was partially anchylosed.

FIBULA.

No.	Age when it occurred.	Time since it occurred.	Sex.	Right or left side.	Character of fractures.	TREATMENT.	RESULT.				
							United or not.	When united.	Amount of shortening.	Remarks.	Perfect or imperfect.
					MIDDLE THIRD.						
1	12 y.	2 y.	M.	L	Simple, with disloc. of tibia inwards.		U.			Tibia slightly inclined in, and fibula rests against tibia; motions unimpaired.	Imp.
2	20 y.	5 y.	M.	L.	Compound, with disloc. of tibia inwards.		U.				P.
3	14 y.	28 y.	M.	L.	Compound, with disloc of tibia inwards.		U.				P.
					LOWER THIRD.						
4	40 y.	6 m.	M.	L.	Simple.	Dupuytren's splint.	U.				P.
5	57 y.	4 w.	M.		Simple.		U.				P.
6	34 y.	4 y.	M.	L.	Simple.		U.				P.
7	34 y.	24 y.	M.	L.	Simple.		U.				P.
8	26 y.	9 m.	M.	R.	Simple.	Dupuytren's splint, &c.	U.				P.
9	25 y.	6 w.	M.	L.	Simple.	Cold water dressings.	U.				P.
10	60 y.	2 m.	F.	L.	Simple, with disloc. of tibia inwards.	Dupuytren's splint.	U.				P.
11	20 y.	4 y.	M.	R.	Simple.		U.			Foot inclined out; fibula falls against tibia; motions of joint perfect.	Imp.
12	32 y.	20 y.	M.	L.	Simple.		U.			Occasionally swells.	Imp.
13	30 y.	2 y.	M.	L.	Simple, dislocation of tibia inwards.	Dupuytren's splint.	U.			After 2 years, occasionally swells.	Imp.
14	32 y.	3 m.	M.		Simple, dislocation of tibia inwards.		U.			Tibia slightly displaced in, and fibula falls against tibia.	Imp.
15	35 y.	5 w.	M.		Simple, dislocation of tibia inwards.	Dupuytren's splint.	U.			Slight projection of mal. inter.	Imp.
16	22 y.	20 y.	M.	L.	Simple, dislocation of tibia inwards.		U.			Upper fragment of fibula behind lower; ankle stiff, &c.	Imp.
17	21 y.	8 m.	M.		Simple, exter. mal., dislocation of tibia inwards.		U.			Lower fragment of fibula carried down; slight projection of mal. inter.	Imp.
18	12 y.	10 y.	M.	L.	Simple, dislocation of tibia outwards.		U.			Fragments of fibula fall against tibia; ankle not stiff.	Imp.
19	35 y.	6 m.	M.		Simple, dislocation of tibia forwards.		U.			Exfoliation of bone; ankle stiff.	Imp.

ANALYSIS.

Of 19 fractures of the fibula, 3 occurred in the middle third, and 16 in the lower third. I have no record of a fracture of the fibula alone in the upper third; indeed, in no case has the fracture been noticed at a point above the middle of the bone.

Of those broken in the lower third, 1 was a fracture of the malleolus, 10 were broken from two to four inches above the lower end of the bone, 1 at five inches above, 2 are mentioned as being near the ankle, and of the remaining 5, the exact point of fracture is not mentioned.

9 are known to have been attended, at the time of the accident, with a partial inward displacement of the lower end of the tibia, 1 with an outward displacement, and 1 with a consecutive forward displacement. Whether any displacement of the tibia existed, immediately after the receipt of the injury, in the remaining 8 cases, I do not know.

In reference to the causes of these accidents, 4 were produced by blows received upon the outside of the ankle, 1 by a blow in front, 3 by falls directly upon the bottom of the foot, and 4 by falls upon the side-walk, in which the foot was probably turned out. The 5 first were causes operating directly, and the 7 last, causes operating indirectly.

All were simple fractures, except Cases 2 and 3. All but one occurred in males. 12 are known to have occurred in the left leg, and two in the right. For this unusual disproportion, I find no other explanation, except that as the majority of these accidents seem to be produced by a sudden inversion, or eversion of the foot, the left ankle being usually the weakest of the two, is most liable to be thus displaced. Possibly the fact here noticed, may be a mere accidental coincidence, which an analysis of a larger number of cases would reverse; indeed, Dupuytren, in an analysis of 207 cases of fracture of the fibula, found that $\frac{7}{10}$, more than two-thirds, occurred in the right leg.

For an interesting discussion of the manner in which these fractures are produced, see *Malgaigne*, op. cit., vol. i. pp. 805–13.

The ages ranged from 12 years to 60, and averaged 29. Malgaigne never saw this fracture in a patient under 15 years.

5 were treated by Dupuytren's splint. All have united; 9 without any, and 10 with more or less deformity, or other imperfection. In 5 cases, the lower end of the tibia remains slightly displaced inwards, or is unusually prominent on the inner side, and the foot inclines a little outwards. In four cases, the fragments of the fibula have united, resting against the tibia, at the point of fracture, in 3 of which, it is noticed that the motions of the ankle-joint are not impaired; a fact which ought to be received as evidence of the incorrectness of the opinion held by Dupuytren, that the stiffness

of the ankle, which so often follows these accidents, was due alone to a displacement of the lower end of the fibula, and which he claimed would not follow where his own dressing had been properly applied. As bearing also upon this point, see vol. ix. p. 168, of the *Transactions* of this Society, part second, of this report.

In 4 cases, more or less stiffness of the ankle-joint remained; in Case 19, after six months; in Case 13, after two years, it was occasionally swollen and stiff; in Case 12, after twenty years, it was also occasionally swollen and stiff; and in Case 16, after twenty years, it remained constantly quite stiff.

TREATMENT.

Since a lateral displacement of the lower end of the tibia, or a lateral rotation of the foot upon the tibia, occurs in so large a proportion of fractures of the fibula, their treatment can scarcely be considered separately. I shall, therefore, content myself in what I have to say upon this subject, by a reproduction of a part of my "Report on Dislocations," published in *Transactions of the Medical Society of the State of New York*, for 1855, pp. 89–90.

"In every instance, the dislocation of the tibia inwards has been accompanied with a fracture of either the fibula or of the malleolus internus, or of both. I think, however, I have seen two or three inward dislocations of the tibia without a fracture, but I find no record of such cases, nor does my memory enable me to recall them.

"In classifying dislocations of the ankle, I have adopted the usual nomenclature, and have named all those dislocations in which the tibia projects inwards from the foot, 'inward dislocations of the tibia,' yet I have some doubts as to the propriety of this appellation. This accident seems to me to have been in general rather a lateral *rotation* of the foot upon the lower articulating surfaces of the tibia and fibula. Of all the ginglimoid joints, the ankle approaches most nearly in form to a ball and socket joint, in consequence especially of the marked prolongations of the malleolus internus and externus. In other ginglimoid articulations lateral displacements are not unfrequent, but lateral rotation can scarcely by any accident occur. Here, however, the reverse holds true; lateral displacement is difficult, while lateral rotation is comparatively easy of accomplishment.

"The majority of cases which occur involving a disturbance of the relative position of the ankle-joint surfaces, are, I am satisfied, of this latter character, viz., lateral rotations within the capsule, rather than true dislocations; and although the restoration of the joint surfaces to position is, in general, easily accomplished; yet, in consequence of either a fracture of the fibula, or malleolus internus, or of a rupture of the internal lateral ligaments, it will almost always happen that some deformity will remain. The fragments of the fibula will fall inwards towards the tibia, and the foot, unsupported by either its fibula or its internal ligaments, will incline perceptibly outwards. Nor can this be prevented, usually, by any mechanical contrivance. Indeed, it would be easy to demonstrate, as I have often done to my pupils, that even Dupuytren's splint, usually employed in this accident, must fail of success in a great majority of cases; since the subsequent deformity is due, less to the fracture of the fibula and its consequent displacement, than to the loss of the internal ligaments, which loss nature can seldom fully repair. The whole apparatus of the joint has suffered greatly, and its form and functions, therefore, are not likely to be completely restored, whether the fibula has participated in the injury or not.

"If, however, it were true that a fracture and displacement of the fibula is the sole, or essential cause of the subsequent deformity, it would still be found generally impracticable to avoid the maiming, since it would still remain impossible to lift the broken ends from the tibia, against which, or in the direction towards which, they are so prone to fall. Inversion of the foot does not accomplish it, nor have I ever been able to make anything but the most trivial impression upon the upper end of the lower fragment by pressure upon the lower extremity of the fibula.

"I think too much confidence has been placed in the efficiency of 'Dupuytren's splint.' I believe, indeed, that this splint ought generally to be preferred as a means of support and retention, after this accident; but I doubt whether it is able to accomplish more than a moiety of all that its illustrious inventor proposed.

"In two, only, of all the cases reported, am I quite certain that there was an actual internal displacement of the tibia upon the astragalus (4 and 5); but even in these cases it seems probable that the displacement was not complete, but that a small portion of the articular surface of the tibia continued to rest upon the astragalus. In neither of these instances was reduction ever accomplished. The cause of this failure I am unable to explain."

CHAPTER XVIII.

TIBIA AND FIBULA.

Upper Third.

CASE 1. *Simple fracture. Result perfect.*

May 23, 1851, a man employed on a steamboat, broke both bones of his leg, below the knee. The tibia was broken just below the tuberosity. He was about 25 years old. A German physician first examined the limb, but did not discover any fracture. On the eighth day, he was seen by Dr. M. and myself. Motion and crepitus were then distinct, but the fragments of the tibia were not displaced. We applied a gutta percha splint, and he recovered in the usual time, and without deformity.

CASE 2. *Simple fracture. Result imperfect.*

Elias Tozer, æt. 21, fractured both bones of the leg about three or four inches below the knee. Drs. B. and S., of Ohio, took charge of the case.

Five years after, I measured the limb and found it shortened, by over-riding of the fragments, five-eighths of an inch.

CASE 3. *Simple fracture. Result imperfect.*

Tim. Logan, of New York. Simple fracture, near the lower end of the upper third. He was treated at the New York City Hospital.

I saw him soon after union of the fragments had occurred. The leg was shortened half an inch.

CASE 4. *Simple fracture. Delayed union. Result imperfect.*

F. C. Trask, of Erie Co., N. Y., æt. 35, broke his right leg, in jumping from a buggy, in June, 1852. Fractures oblique in both bones: near the lower end of the upper third: simple. Drs. S. and A., in attendance.

The limb was dressed with lateral splints, made of white wood, and with compresses and bandages, and then laid upon a pillow.

Eight weeks after the fracture had occurred, the gentlemen wished me to see the limb with them. I found Mr. Trask still in bed, and the fragments not at all united.

Mr. Trask had enjoyed average health heretofore, but he was never very robust. When I was called to see him he looked pale; his skin was cold and moist; his pulse 120, and his appetite poor. The broken leg and foot were greatly swollen. The swelling was œdematous. Considerable excoriations existed on the back of the leg. The fragments were quite movable, and were overlapped three-quarters of an inch.

We agreed that the patient ought as soon as possible be got out of bed, so as to enable him to recover his strength, which had sadly declined. To this end, a gutta percha splint was made to fit accurately the whole length of the leg; and having attached a large number of tapes, it was to be secured upon the limb. Several times each day it was to be removed, and the limb bathed with brandy and water. Slowly also the limb was to be brought down to the floor, and the patient be made to sit up, and as soon as possible, he was to walk with crutches, or to ride.

Nov. 4, 1852, Mr. Trask visited me at Buffalo. The directions had been followed implicitly. About two weeks after my visit, he rode out, and in about nine weeks, or seventeen weeks from the time of the fracture, the bones were found united. His health and strength were quite restored, and the limb was no longer œdematous. It is straight, or with only a slight projection of the upper fragment in front of the lower, and it is shortened three-quarters of an inch.

CASE 5. *Simple fracture. Result imperfect.*

James Kelly, æt. 39. Simple fracture of right leg, between three and four inches below the knee-joint.

The limb was dressed by a surgeon in Ireland.

Six years after, Nov. 7, 1853, I found the limb shortened one inch and a half, and much bent backwards at the seat of fracture. Knee partly anchylosed.

CASE 6. *Compound fracture. Result uncertain.*

Frank Goodrich, of Buffalo, aged about 30 years, broke his left leg, near the lower end of the upper third. The integuments were penetrated and much bruised.

I was called on the same day, Aug. 25, 1847, and proceeded immediately to dress the fractures. The fragments were easily replaced, but they did not support each other sufficiently to prevent a shortening when allowed to take care of themselves.

I dressed the wounds in a simple manner, and then applied first a flannel roller, and over this felt splints, secured with additional turns of the roller. The limb was laid over Post's double inclined plane, and so secured to the foot-piece as to make moderate extension.

On the fortieth day, all dressings were removed, and the limb was firm, straight, and of the same length as the other. The other leg had been broken some years before. (See Case 7.)

CASE 7. *Simple comminuted fracture. Result uncertain.*

Frank Goodrich, aged about 25 years, was thrown from a horse, breaking his right leg, four inches below the knee, near the middle, and again near the ankle. The fracture was treated by Drs. S. and B., of Buffalo.

Five years after, I find the limb quite straight, but the several points at which he says the fractures occurred, are tender, and present irregularities, which confirm the patient's statements. It is probable that the limb is shortened, but as the other leg was broken when I examined this leg, I could not determine. (See Case 6.)

CASE 8. *Compound fracture. Result imperfect.*

Joseph Roach, æt. 84, broke his leg, near the lower end of the upper third. Dr. P., of Lagrange, N. Y., was employed. Fracture compound.

Eight years after the date of the accident, the leg was shortened three-quarters of an inch, and very much bent at the seat of fracture.

CASE 9. *Compound comminuted fracture. Result imperfect.*

Rossel B. Davis, of Versailles, Cattaraugus Co., N. Y., æt. 50. June 1, 1854, he was kicked by a horse while sitting in his wagon, and immediately thrown out.

Drs. E. and B. were immediately called, and dressed the limb.

June 2. I met these gentlemen in consultation. I found the tibia had been broken four inches below the joint. We could not determine where the fibula was broken, but believed to be near the same point. Dr. Ellis had removed five fragments of bone, and had left other fragments whose attachments to the soft parts underneath emoval difficult. They then laid the limb upon a board, and applied a many-tailed bandage and side b bled constantly for twenty-four hours, from two w ach of which seemed to be made by the corks of the hors shoe.

I made very little change in the treatment, except to place the limb in a box. Cool water dressings were directed, and after a few days, it was advised to fill the box with bran.

At the end of four weeks, there was no union, and the leg was shortened one inch. Extension was then applied, and July 20, the starch bandage was added.

Aug. 6, tolerably firm union had occurred, and the limb was shortened only three-quarters of an inch. Since then several fragments of bone have escaped.

April 1, 1855, he was about his farm.

Oct. 6, 1856. He still walks with a slight halt.

Middle Third.

CASE 10. *Simple fracture. Result perfect.*

Walter Redmond, of Buffalo, æt. 38, was admitted to the Buffalo Charity Hospital, with a fracture of both bones of the leg, a little below the middle, Dec. 15, 1851. Fracture occurred three days before admission, in consequence of a fall upon the side-walk.

I applied a paste bandage, on the 17th of Dec., and Jan. 17th, 1852, I removed all dressings. The fragments were united without either shortening or perceptible deformity. A small amount of ensheathing callus at the seat of fracture.

CASE 11. *Simple fracture. Result perfect.*

John Maloney, æt. 16, was admitted to the Buffalo Hospital, with a fracture of both bones of the leg, near the middle. Fracture simple. Bones never displaced.

It united in the usual time, without shortening or deformity.

CASE 12. *Simple fracture. Result perfect.*

Thomas Cassody, æt. 17, admitted to the Buffalo Hospital, Oct. 7, 1853, with an oblique, simple fracture of the left leg, in its middle third. The accident occurred the day before admission, from a blow with a piece of wood. It was dressed by a physician in town, with a roller and side splints.

Oct. 8, I removed the dressings, and laid the limb over a double inclined plane, making some extension by means of a paste gaiter. The limb was swollen at the seat of fracture.

Oct. 9. Opened the dressings.

Oct. 16. Renewed the dressings. No union. No ensheathing callus.

Oct. 19, removed limb from double inclined plane, applied paste bandage.

Nov. 7. Union incomplete. Removed all dressings. Laid limb on a pillow, and directed cold water baths.

Nov. 17. Union complete. No ensheathing callus. No shortening or deformity.

CASE 13. *Simple fracture. Result perfect.*

Edward Evans, of Buffalo, æt. 10, fractured the left leg, near its middle. Dr. C., of Buffalo, was employed.

Fifteen years after the accident occurred, the limb was perfect.

CASE 14. *Simple fracture. Result perfect.*

Wm. McCormick, of Buffalo, æt. 19, broke both tibia and fibula, near their middle. Fracture simple and transverse.

I applied a paste roller. The fragments united, without shortening or deformity.

CASE 15. *Simple fracture. Result perfect.*

Joseph Werner, æt. 15, was caught under a load of wood, which was capsized, Sept. 24, 1852, breaking the left tibia obliquely, near its middle. Crepitus and motion distinct. I think the fibula was broken also, but I cannot say positively, since I could not feel any crepitus or motion which could be clearly charged to it. The general mobility of the limb, however, and the severity of the injury, seemed to imply a fracture of the fibula.

I dressed the limb with a gutta percha splint, and laid it upon a double inclined plane.

On the sixteenth day, motion was distinct between the fragments. Removed double inclined plane, under the belief that the position increased the liability to motion between the fragments. Continued side splints, and laid the leg on a pillow.

On the twenty-first day, union had occurred, but the limb was slightly bent at seat of fracture. The fragments were displaced outwards. As the callus was still flexible, I laid the limb again upon the double inclined plane, and used some force to straighten the fragments. This procedure was successful, and did not hurt him but very little.

On the twenty-seventh day, in presence of Dr. Bowen, I removed all dressings. No shortening; no deformity; very slight ensheathing callus. Reapplied side splints only.

CASE 16. *Simple fracture. Result perfect.*

John Stancleft, of Buffalo, æt. 20, was struck by the boom of his vessel, breaking both bones of one leg, near the lower end of the middle third. The accident occurred Nov. 12, 1854, and he was brought to the hospital, and placed under the care of Dr. W., marine surgeon, Nov. 13.

I saw him repeatedly during the progress of the cure. The fragments were united on the twenty-second day, and I could not discover, at any time, ensheathing callus.

Oct. 18, 1856. The limb was neither shortened, nor in any manner deformed. The ankle, however, was occasionally painful.

CASE 17. *Simple fracture. Result perfect.*

Thomas Ryan, æt. 31. While walking on the railroad track, Jan. 28, 1854, he slipped and fell, the back of his right leg coming upon the iron rail, and breaking it at a point, I think, rather below the middle. The fracture was simple.

On the following day he was brought to the hospital, the limb not having yet been seen by a surgeon, or dressed. I found the fragments not displaced, and the limb very little swollen.

We laid the limb upon a pillow, and having folded the pillow around its sides, we laid along, outside of the pillow, two wooden splints, and these were secured in places by strips of bandage tied over the pillow and splints together. The foot was also carefully supported.

On the fourth day, Dr. Pupikofer, the intelligent house surgeon, applied a paste bandage to the whole limb.

March 10, six weeks from the date of the fracture, all dressings were laid off. The bones were firmly united, and without ensheathing callus. The limb was neither shortened nor deformed.

CASE 18. *Simple fracture. Result perfect, according to my notes; but subsequently found by another surgeon to be shortened, &c.*

Joseph Beyer, æt. 70. A heavy stone fell against his left leg, Aug. 30, 1854, breaking both bones near the middle. Fracture simple.

I do not know who had charge of him at first, but on the eighth day he was brought to the Buffalo Hospital, during the service of Dr. W. Beyer says the fragments were never displaced. Side splints, &c., were applied.

Oct. 1, 1854, when I took charge of the limb, four weeks and five days after the occurrence of the fracture, bony union was complete, and I removed all dressings. On measuring the limb, I could not detect any shortening, nor could I discover any displacement of the fragments. I find, however, a note made subsequently by the house surgeon, to the effect that the limb was shortened one-quarter of an inch, and that the lower fragment was advanced slightly in front of the upper, so as to interrupt the anterior line of the spine of the tibia. There was no ensheathing callus, he also adds.

CASE 19. *Simple fracture. Result perfect, except that an ulcer exists over the seat of fracture.*

Michael Gallaghar, æt. 63, fell through a hole in the floor, breaking his leg near the lower end of the middle third. Dr. W., of Detroit, was employed. In four months he was able to walk.

Jan. 1856, about twenty months after the accident, he was received into the Buffalo Hospital, for an irritable and large ulcer, situated over the point of fracture. He says that during the progress of the cure a blood blister formed over the fracture, and that it soon formed an ulcer, which has never healed.

The limb is neither shortened nor deformed.

CASE 20. *Simple fracture. Result perfect.*

Henry Simpson, of Buffalo, æt. 30, was kicked violently by a man with whom he was wrestling, breaking the tibia and fibula of the left leg near the lower end of the middle third. This occurred April 27, 1853, and I was immediately called. The limb was already a good deal swollen over the seat of fracture, but I was able to detect crepitus and motion in both the tibia and fibula; there was, however, no perceptible displacement of the tibia.

I applied my lateral splints, and laid the limb upon a pillow.

May 13, I examined the limb and found the fragments not yet united. No ensheathing callus. A paste bandage was substituted for the side splints.

paste bandage was opened. Union of fragments ensheathing callus, and the limb not shortened or deformed.

CASE 21. *Simple fracture. Result perfect.*

John Heisler, 151 Oak Street, Buffalo, æt. 14, fell on the side-walk, Jan. 13, 1854, breaking his left leg six inches above the ankle. The fracture was simple, and the tibia was broken transversely; fragments not displaced.

I dressed the limb with a paste bandage.

Feb. 22, the bones were united and I could not detect any ensheathing callus. The limb was in all respects perfect.

CASE 22. *Simple fracture from muscular action. Result perfect.*

F. Young, æt. 41, fell in March 855, while walking upon a slippery side-walk, breaking the left leg near its middle. He thinks the leg broke before he struck the ground. Fracture simple and oblique.

Dr. Nelson, of Buffalo, was called, and dressed the limb with moulded copper side splints, laying the limb upon its side. On the third day Dr. N. requested me to see the patient with him. The fragments were then in place, nor had they ever been much displaced; yet motion and crepitus were distinct. The treatment was not changed. Three months later, the limb was well and in all respects as before.

CASE 23. *Simple fracture. Result imperfect.*

Wm. Baker, æt. 38, fractured his leg in Sept., 1852, and was taken to the Erie County Almshouse. His health was good previous to the accident. The fracture was simple, and in the middle third. Drs. F. and W. had charge of the limb.

Eight months after the accident occurred, he was unable to walk except with crutches, owing to the swelling and soreness about the ankle-joint and foot. The leg was shortened half an inch. The upper end of the lower fragment of the tibia now projects forwards slightly, and over-rides the lower end of the upper fragment.

During a part of the time, it had been treated with the paste bandage.

CASE 24. *Simple fracture. Result imperfect.*

Mary Jane Carney, æt. 18. Admitted to the Hospital of the Sisters of Charity—Dr. W.'s service—Sept. 19, 1853, with a fracture of the leg in its middle third. Fracture simple and oblique. The accident had occurred two days before by being thrown down upon the side-walk. Dr. R., of Buffalo, had first dressed the limb.

Oct. 1, when I took charge of the ward, the limb had been dressed only two days before, and I saw no occasion to disturb it.

Oct. 8, I removed the dressings, and found the limb shortened three-quarters of an inch. Fragments partially united. No ensheathing callus. I dressed the limb with a paste bandage and with splints of pasteboard.

Oct. 18. Opened the dressings. Union not complete. No ensheathing callus.

Nov. 6. Removed dressings entirely. Union complete. Shortening same as when I first took charge of the case. The upper fragment was a little in front of the lower. No ensheathing callus. I permitted her now to walk with crutches.

CASE 25. *Simple fracture. Result imperfect.*

J. C., of Buffalo, aged about 25 years, had his leg broken by the falling of a heavy plank upon it, Feb. 25, 1854. The fracture in the tibia was oblique, and about six inches above the ankle. The fibula was also certainly broken, but at what point, I could not determine. The plank struck also upon the back of his neck and produced a concussion of the spine, which paralyzed the bladder, and for several days I was obliged to relieve his bladder with a catheter.

I dressed the limb with junks and side splints, and laid it in a box.

March 14, seventeen days after the accident occurred, there was no union of the bones, no ensheathing callus, very little swelling, and no displacement. From this time he remained under the care of another surgeon until nearly the eighth week. He was then taken to the hospital, where he remained three weeks longer.

July 31, 1854, I found the limb shortened one inch, but with very little deformity. He wears an extra heel under this foot.

CASE 26. *Simple fracture. Result imperfect.*

Honore More, æt. 18, admitted to the Buffalo Hospital of the Sisters of Charity, June 18, 1853. Dr. W.'s service. Simple oblique fracture of the right leg, near the lower end of the middle third. Considerable inflammation and swelling followed. Dressed with Scultetus bandage and side splints.

ks after, at the beginning of my service, I found the ne inch; the upper fragment overlapping the lower its outer, or fibular side. The foot still remained swollen, a she was able to walk only with crutches. I ordered the bandages to be removed, and directed the limb to be rubbed with a stimulating liniment.

Nov. 6, five months from the time of the accident, she was just beginning to walk without crutches. At no time, after she came under my charge, could I detect ensheathing callus.

CASE 27. *Compound fracture. Result perfect, except that a fistulous discharge has continued from the point of fracture.*

The infant daughter of Mr. Armstrong, residing on Washington Street, had her left leg broken , 1852, a little below its middle. A woman had fallen upo accidentally, and the broken tibia was thrust through the skin.

Dr. S. was called, and, by his request, I saw the patient with him. We found the upper fragment of the tibia projecting through the skin, and at first we were unable to reduce it. We then gave her chloroform, and with great effort finally succeeded. We dressed the limb with a gutta percha splint, and laid it upon a pillow.

Oct. 21, six weeks after the accident occurred, I found the limb firmly united and straight. Some ensheathing callus could be distinctly felt, and a fistulous discharge continued from the seat of fracture.

CASE 28. *Compound fracture. Result perfect.*

Wm. Kearney, æt. 35, fractured both bones of his leg, near its middle. Fracture compound. Dr. L., of Cattaraugus, N. Y., was employed.

Four months after, I found the bones united, without displacement, and the wound healed.

CASE 29. *Compound fracture. Result nearly perfect.*

Mrs. Margaret Conner, æt. 65, was admitted to the Buffalo Hospital of the Sisters of Charity, Dec. 19, 1856, with a compound fracture of the left leg. Fracture at the lower end of the middle third, very oblique. Direction of fracture downwards and inwards: the upper fragment being in front of the lower. The accident had resulted from a fall upon the ice, four days before her admission, and the bone had been thrust entirely through the skin. It was dressed by Dr. G. When admitted, the limb was much swollen and vesicated.

I dressed the limb with gutta percha splints carefully moulded, and laid it upon its outside, after the method of Pott.

Jan. 1, 1857, finding that she would not lie upon her side, and that the limb was liable to displacement on account of her frequent changes of position, I laid her leg over Day's double inclined plane, and secured it snugly.

Jan. 14. Union firm, with a shortening of one-quarter of an inch. Removed the leg from the double inclined plane.

Feb. 7. The limb looks and feels perfectly straight, and one cannot discover that it is shortened, except by measurement.

CASE 30. *Compound fracture. Result imperfect. Delayed union. Slough on heel, &c.*

W. S. Mooney, æt. 35; a farmer. In the winter of 1853 and '54, both legs were caught in a threshing machine, breaking the right leg near the lower end of the upper third, and the left leg near the ankle. (See Case 112.)

Dr. E. dressed his limbs, and continued in charge to the close of the treatment. The legs were both laid over a double inclined plane. The wounds occasioned by the injury were not healed at the end of seven weeks, nor was the bone united. There was also at this time a large slough upon the back of the heel.

About the first of May, 1854, four months after the injury was received, he began to walk upon crutches.

Jan. 2, 1855, one year after the accident occurred, I examined his leg at the Buffalo Hospital.

His right leg was quite crooked, the lower part of the limb having fallen back out of line. Mooney says this was occasioned by a pillow which was laid under the fracture to prevent pressure upon the heel. The leg is shortened three-quarters of an inch.

CASE 31. *Compound fracture. Result imperfect.*

John Phaley, æt. 25. Fractured at the same time his right arm and left leg—also dislocated right shoulder. (Fractures of Humerus, Case 34.) Fracture of leg compound. I think it was broken below the middle.

Dr. R., of Dunkirk, first dressed the limb. On the third day it was dressed by Dr. P., of Buffalo.

On the twelfth day he came under my charge at the hospital.

The fragments were already quite firm. Leg shortened one quarter of an inch. The same was the condition of the limb when he left the hospital. No extending apparatus was ever employed.

Case 32. *Compound fracture. Result imperfect.*

Thurstone Carpenter, æt. 4, received an injury, breaking both bones of the leg near its middle. Fracture compound. It was treated by Dr. C., of Buffalo.

Twenty-three years after the accident, Mr. Thurstone called upon me on account of a paralysis of his lower extremities, which had recently occurred. He stated, that from the time of the fracture until within about one year, an open ulcer had existed over the seat of fracture; and that soon after it had closed over completely he began to lose the use of his limbs. During the time it was open, small scales of bone have frequently been thrown off. The limb is half an inch shorter than the other.

Case 33. *Compound fracture. Result imperfect. Abscess and ulcer.*

Joseph McEllicott, æt. 22. Fracture near the middle of the left leg. Compound and oblique. At the same time also he fractured his right thigh and his lower jaw. (See Fractures of Femur, Case 73.)

He was admitted into the Buffalo Charity Hospital three months after the fracture was received. The bones of the leg were then united, but with a shortening of an inch and a half; the upper fragment riding in front of the lower. The wound over the seat of fracture was not healed, and there was an abscess in the back part of the leg, which still continued to discharge pus freely. On the back of the heel there existed also a deep ulcer.

Case 34. *Compound fracture. Death.*

Martin Foot, of Pittsfield, Mass., æt. 8, had his right leg broken in a cider-mill, Oct. 22, 1841. Fracture of tibia transverse, at a point a little below the middle of the leg, and the end of one fragment was thrust four inches through the skin, being accompanied with extensive laceration.

I reduced the fragments and closed the wounds with sutures and adhesive plasters, applying also one side splint, with Scultetus bandage. The limb was laid upon a pillow, elevated, and cold water dressings directed.

I did not see this patient again, but he was left in the charge of Dr. Henry Childs, of Pittsfield, Mass., from whom I subsequently *learned* that the lad survived the accident only two or three months.

CASE 35. *Comminuted fracture. Both legs broken. Result uncertain.*

Michael Carmody, æt. 19. May 9, 1849, a heavy bar of iron fell across his legs, breaking the right tibia and fibula, four inches above the ankle, and again near the middle. Both fractures of the tibia oblique. The left tibia and fibula were also broken, just above the ankle. Michael was received at the hospital on the same day, and both legs were at once dressed with dry rollers, and supported with splints and pillows.

May 16, seven days after the fractures, the swelling of the limbs being considerably reduced, the starch bandage of M. Suetin was applied to each leg.

May 18, he was allowed to sit up in bed or in a chair.

May 29, the swelling having still more subsided, the bandages were found slightly loosened. They were laid open and made smaller by cutting out a small strip, from the knee to the toes, and afterwards readjusted and secured by a dry roller.

June 13, five weeks after the fracture, the dressings were removed, and the limbs were sound and seemed perfect, except that considerable stiffness existed in the left ankle-joint. As both legs were broken, however, it is impossible to say positively that they were not shortened.

CASE 36. *Compound comminuted fracture. Result perfect.*

Luther C. Peck, Nunda, Livingstone Co., N. Y., æt. 14, was run over by a loaded sleigh, breaking his left leg through its middle third. The fracture was compound and comminuted. It was treated by Dr. Thayer, of Onondaga Hill, N. Y. No extension was employed.

After forty years, I examined the limb and could find no trace of the injury.

CASE 37. *Compound comminuted fracture. Union with shortening.*

Isaac Hoffer, of Buffalo, æt. 28, was thrown from a wagon, June 16, 1845, breaking the tibia and fibula of the left leg. The fracture was oblique, compound and comminuted, a fragment half an inch in length being removed immediately. The fracture occurred a little below the middle of the leg.

The limb was dressed by Drs. Sprague and Bronck, assisted by myself, with side splints, and then laid upon a double inclined plane.

On the seventh week the external wound had closed and the

ed. I then removed the splints and applied a paste
also was removed on the fifty-seventh day.
shortened half an inch.

CASE 38. *Compound fracture. Result imperfect.*

Jeremiah Caveney, æt. 33. Oct. 8, 1855, his right leg was caught between the side of a railroad car and a water tank, producing a compound fracture near the lower end of the middle third. Fracture of the tibia nearly transverse.

Dr. W., assisted by Dr. S., saw and dressed the fracture temporarily, about six hours after it occurred. A single splint was applied to the outside of the leg, which was retained in place by a roller; he was then taken to the Hospital of the Sisters of Charity, the limb was laid upon a pillow, and cool water lotions applied.

Oct. 9, I found him at the hospital The bleeding had nearly or quite ceased. The circulation in the limb being rather imperfect, I suspended the cool water lotions, but left the dressings undisturbed.

Oct. 10. Cut open the dressings opposite the fracture, but did not disturb the splint, still fearing that the bleeding might recur. Wound in the flesh gaping, and four and a half inches in length. The tibia could be seen through the wound. I was unable to bring the edges of the wound together, I therefore laid over it a piece of lint spread with cerate.

Oct. 12. The limb had become more swollen and inflamed. He did not complain of the dressings, but on removing the splint, we found it had produced an ulceration over the malleolus externus; cool water irrigations were again ordered, the limb being carefully supported by a pillow covered with an oil cloth.

Oct. 14. Swelling and inflammation were still increasing. The limb would not bear any pressure, even such as was necessary to keep the fragments in place. I had it suspended carefully in a sacking, after the manner of Mayor, and continued the irrigations.

Oct. 19. We found it impossible to steady the limb in this position, and it was transferred to a box of bran, into which it was carefully and snugly packed. Still, however, we were unable, by any amount of pressure which he could tolerate, to prevent the lower end of the upper fragment from tilting forwards. This inclination had been noticed from the first, but never successfully resisted The swelling had now begun to subside.

Oct. 27. The wound was discharging freely; the swelling was abated, but he could not bear any pressure, not for a moment; nor could he tolerate any efforts on our part to restore the fragments.

Nov. 18, the limb was taken from the box.

Dec. 31. It is on this day first mentioned in my hospital records, that the fragments had united firmly. I think, however, it was united some time before. The leg had shortened only about one-quarter of an inch, but the upper fragment had slid forwards upon the lower fragment nearly the whole of its diameter, making a remarkable projection in front. The lower part of the leg and foot fell slightly backwards. It was five months before he began to walk without crutches.

Aug. 24, 1856, nearly three years after the accident, I examined the limb, and found the same shortening of the limb, and the same deformity, but the limb as useful as the other. There is no ulceration, but only some unusual tenderness over the projecting bone. Over the malleolus externus is seen a scar about one inch in diameter, left by the ulceration occasioned by the splint. There is no stiffness in the ankle, and he walks firmly and without the slightest halt. He is a laborer, working day and night through a great part of each summer, in a wheat elevator, and receiving wages of $36 per month. He says he is entirely satisfied; he knows that every possible care was taken to prevent deformity, and he is thankful that his limb was saved at all.

I have related this case unusually at length, because it illustrates what great deformity may sometimes result where the utmost care and attention are employed in the treatment; and also how great may be the deformity in other cases, without any degree of maiming.

CASE 39. *Compound comminuted fracture. Result imperfect.*

John Ott, of Buffalo, æt. 48, was admitted to the hospital, Dec. 18, 1849, with a compound comminuted fracture of the left leg. He was also much bruised about his back, and his scrotum was badly lacerated. A wagon load of wood had fallen upon him.

We simply supported the limb in a box until the eighth day, when, the swelling having sufficiently subsided, we applied a paste bandage, and also made extension and counter-extension over a double inclined plane.

At the end of five weeks we removed the limb from the splint, and found the bones united, with a shortening of half an inch. During the treatment, we had used all the extension he could bear, and, indeed, we had frequently to relax the extension. We had also the usual difficulty, where the limb is laid upon its heel, of more or less pain in this part, compelling us to make frequent changes.

Nine months after the fracture occurred, he still complained of a stiffness in his ankle and knee-joint.

CASE 40. *Compound comminuted fracture. Both legs. Result imperfect.* (See Case 105.)

John Curran, æt. 23. Both legs broken by the fall of a heavy stone upon them. Right leg broken about its middle. Comminuted. Anterior tibial artery ruptured. Left leg broken in a similar manner near the ankle.

I laid both limbs over a double inclined plane made of pillows, covered with oil-cloth. To both legs I applied light side splints. The limbs were elevated, and kept moist with cool water dressings. In the afternoon of the same day, the swelling had greatly increased, and on the sixth day I placed the right leg in a box containing bran, and the left in a swing splint. No suppuration or sloughing, of consequence, occurred, although the left leg was very cold and insensible during several days, and I was obliged, after the first day or two, to let it rest upon a lower plane, and to discontinue the cold water.

At the end of two weeks I applied, for the first time, moderate extension and counter-extension. After four weeks, all extension was laid aside, the bones having united, with a shortening of about three-quarters of an inch in each leg, and with corresponding deformity.

It is quite probable that if we had made any attempts to extend either limb on the first few days, it would have resulted in the loss of both.

CASE 41. *Compound comminuted fracture. Death on the fifth day.*

John Harkner, of Buffalo, æt. 20, was struck by a falling tree, Jan. 30th, 1852, breaking his right leg, near its middle. The skin and flesh were extensively torn, and both bones were broken, and slightly comminuted. Dr. Bryant Burwell and myself, in attendance.

In order to reduce the bones, I was obliged to enlarge the opening in the skin. I tied the anterior tibial artery, which was wounded and exposed. Finding that I could not retain the fragments of the tibia in place, I bored their ends with a shoemaker's awl, and wired them together. I dressed the limb carefully, and laid it in a well moulded gutta percha splint, supporting it with pillows, &c.

Harkner died on the fifth day from a low irritative fever, supervening upon the shock.

CASE 42. *Compound fracture, complicated with a fracture of the femur on the same side. Result imperfect.* (See Case 50 of Fractures of Femur.)

Thomas Dolanty, of Buffalo, æt. 31, was run over by a loaded cart, Aug. 14, 1854, breaking his right thigh about six inches above the knee, and his leg eight inches above the ankle. I applied a straight splint with extension, using a paste gaiter to secure the leg and foot to the foot-piece. I also applied bran junks along the leg and thigh. On the tenth day, at my request, Dr. Boardman took charge of him.

At the end of seven weeks the fragments were united, but overlapped one-quarter of an inch. The point of overlapping was very perceptible. There was no appearance of ensheathing callus. The limb was straight.

CASE 43. *Compound comminuted fracture. Amputation on thirteenth day. Death on the sixteenth day.*

John Slack, of Buffalo, about 40 years old, had his right leg broken, June 28, 1847, by being caught between the buffers of a couple of railroad cars. Dr. W., of Buffalo, in attendance.

Dr. W. requested me to see the patient with him. Probably three inches of each bone were completely comminuted, being broken into fifteen or twenty fragments. These fragments were mostly removed with forceps. Considerable venous hemorrhage existed, but the arterial circulation in the foot was unimpaired. Both the anterior and posterior tibial arteries were pulsating distinctly. The constitutional shock was not excessive.

We determined to attempt to save the limb. The limb was accordingly laid in a box well lined with cotton batting. Cold water dressings were applied to the wounds.

On the ninth day, he had a slight diarrhœa, but the red line of demarcation was established around all the sloughs.

On the thirteenth day, he was more feeble, and the wounds looked unhealthy. Dr. W. amputated the limb six inches above the knee. On the sixteenth day after the accident, and three days after the amputation, he died.

npound comminuted fracture. Result imperfect.

, of Cayuga Co., N. Y., æt. 32, was caught in a steam ne in Sept., 1848, breaking and comminuting his leg ower end of the middle third. Dr. P., of Sterling, N. Y., was employed.

The limb was dressed with rollers, side splints, junks, &c., and, during most of the time, supported in a box; and notwithstanding the severity of the original injury, and the violence of the inflammation which followed, the limb was finally shortened only three-quarters of an inch. It was also slightly bent at the seat of fracture.

Lower Third.

CASE 45. *Simple fracture from muscular action. Result perfect.*

Dr. T., of Buffalo, æt. 42, slipped upon the side-walk, and fell, breaking the left tibia and fibula, about three inches above the ankle. The bones broke in the effort to sustain himself, for he heard them snap before he reached the ground. Dr. T. was a very healthy, but rather heavy and muscular man. The fragments were not seen to be displaced.

Drs. Marshall and Stagg, of Buffalo, dressed the limb with a carved splint, and without extension. In four weeks he walked on crutches. He never saw or felt the smallest amount of ensheathing callus upon the tibia.

Twenty-four years after, April 1852, when I examined his leg, no traces of the fracture could be seen.

CASE 46. *Simple fracture from muscular action. Result perfect.*

Mrs. A. P. C., of Buffalo, aged about 25 years. Mrs. W. weighs nearly two hundred pounds. Jan. 10, 1852, she was descending her door steps with an infant in her arms, when, the steps being covered with ice, she slipped and fell, breaking her right leg, just above the ankle. Mrs. W. says she felt and heard the bone snap before she touched the steps. Of this she is certain.

Dr. Flint and myself in attendance.

I found the tibia broken obliquely, the fragments being quite movable, but not much, if at all, displaced. The limb was dressed with a carefully moulded and well padded gutta percha splint, and then laid in a pillow upon the bed. Mrs. W. experienced unusual pain from the fracture, for several days, for the relief of which, I was compelled at times to permit her to inhale chloroform. She was of a nervous temperament, and had frequently resorted to chloroform before to relieve neuralgic pains. The limb became very much swollen, and remained so for a week or two. No extension was ever employed.

Within the usual time the bones united, without shortening or deformity, and in about four months, she was able to walk without any halt.

CASE 47. *Simple fracture. Result perfect.*

John C. Crooks, æt. 14, fractured his right leg, in its lower third. Fracture oblique. Dr. Jewett took charge of the case.

Eight years after, while Mr. Crooks was studying medicine, I examined the limb and found it perfect.

CASE 48. *Simple fracture. Result perfect.*

Wm. A. Ford, of Buffalo, æt. 34. Mr. Ford, who weighs about one hundred and forty pounds, jumped from the driver's seat of a coach, holding in his hands a satchel weighing about thirty pounds, striking square on the soles of his feet, upon a stone pavement. I was immediately called (Oct. 23, 1853), and found his right leg broken through its lower third; the tibia being broken nearly transversely, four inches above the ankle, and the fragments not displaced. The fibula was broken three inches above the joint, and the lower fragment inclined towards the tibia, while the upper fragment was in place. Over the lower end of the upper fragment of the fibula was a large swelling.

Assisted by Dr. Pupikofer, I applied pasteboard splints and bandages.

The fractures united readily, in the same position in which I at first found them. There was no shortening or deformity, at the end of one year after the fracture occurred.

CASE 49. *Simple fracture. Result perfect.*

R. C., of Buffalo, æt. 44, fell down three steps, Aug. 2, 1856, breaking the right leg, about four inches above the ankle. Tibia broken obliquely downwards, and to the tibial side. Simple. Mr. C. weighed at this time one hundred and ninety-six pounds.

I found the fragments of the tibia only very slightly displaced, and after having made strong extension, I dressed the limb with gutta percha splints, and laid it upon its side upon a pillow.

ined the limb, the splints having been removed for had been going about upon crutches for about ›eks. The limb was a good deal swollen, but ap- straight; nor could I discover any shortening.

Case 50. *Simple fracture. Result perfect.*

Thomas Healy, æt. 14, was struck by a cart wheel, breaking both bones of his left leg, through their lower third. Fracture simple and transverse; the doctor said it was "broken square off, like a piece of candy."

Dr. Peacock, of Catheron, Ireland, dressed the limb. He used side splints, made of tin.

Twenty-one years after, I could not discover any trace of the fracture.

Case 51. *Simple fracture. Result perfect.*

Thomas Hazard, aged about rs, fractured both bones of the leg, near the upper end of ›wer third, Sept. 18, 1850. Simple. Fracture of tibia slightly que. Produced by the fall of a tree, directly across the limb.

Dr. Sprague examined the limb on the eighth day, and dressed it with a starch bandage. There was then no displacement.

Oct. 1, he was received into the Hospital of Charity, at Buffalo, and on the 3d of October, I renewed the starch dressing.

On the twenty-eighth day the bones were united; slight provisional callus. On the thirty-second day all dressings were removed. The limb was neither shortened nor deformed in any degree.

Case 52. *Simple fracture. Result perfect.*

John Jarvis, of Port Robinson, C. W., broke the tibia and fibula, near the upper end of the lower third, in Nov., 1851. The limb was treated with simple side splints, by Dr. King, of Port Robinson.

Six months after the accident, while he was an inmate of the Buffalo Hospital, I examined the limb, and found no shortening or deformity, and only a very slight amount of provisional callus.

Case 53. *Simple fracture. Result perfect.*

John H. Messersmith, æt. 15, fractured the tibia and fibula, through the lower third, about four inches above the ankle-joint. Fracture produced by the passage of a loaded wagon across the leg. Simple.

Drs. Pride and Van Pelt, of Erie County, in attendance.

Six weeks after the accident, I found the bones united without shortening, but surrounded with ensheathing callus. There was also a slight outward projection of the fragments.

CASE 54. *Simple oblique fracture. Result perfect.*

Angelica Lamb, æt. 7, fell, June 22, 1841, and broke both bones, near their lower ends: oblique.

Five hours after the accident, I dressed the limb with compresses, a pasteboard splint, and a roller, laying the limb upon a double inclined plane.

In four weeks union was complete, and with no displacement or deformity, except that a small ensheathing callus remained. All dressings were at this time removed, and the patient permitted to use crutches.

CASE 55. *Simple transverse fracture. Result perfect.*

July 14, 1846, I was requested, by John Trowbridge, to see with him a woman whose leg had been broken on the last day of June. She was travelling. Much swelling had supervened, and no attempt had yet been made to restore the fragments to place. We found the displacement lateral, and easily overcôme. Straw junks were employed as lateral supports.

The bones united, without shortening or deformity.

CASE 56. *Simple fracture. Result perfect.*

John Keef, æt. 17, was thrown from a wagon, breaking his leg and his lower jaw at the same time. (See Case 6, Inf. Max.) The leg was broken near the upper end of the lower third. Fracture of the tibia oblique.

I dressed the leg with gutta percha splints. The bones united, without shortening and with only a very slight bend at the seat of fracture.

CASE 57. *Simple fracture. Result perfect.*

Joseph Henry, æt. 6, broke his leg, about two inches above the ankle. Fracture simple.

Dr. Charles Wilcox was employed.

Four months after, I found the limb in every respect perfect.

ple fracture. Result imperfect.

æt. 40, was admitted to the Buffalo Hospital of the y, Dec. 6, 1856. On the evening preceding he had ugh a hole in a plank side-walk, and broken his left leg. It was dressed by Dr. N., of Buffalo, with two lateral splints, binder's board, rollers, &c.

I found the limb much swollen and vesicated, with a purple spot upon the internal malleolus produced by the pressure of the splint. Fracture in the tibia, three inches and three-quarters from the lower end of the malleolus internus; oblique; direction of obliquity from before backwards and downwards; the upper fragment in front of the lower. Limb shortened half an inch. The exact point of fracture in the fibula, we could not determine.

Dr. Lemon and Mr. Coventry made extension and counter-extension, with the limb flexed, but they were unable, even for one moment, to extend the limb to the same length with the other.

I then applied two gutta percha splints, which enveloped nearly the whole limb, and laid his leg upon its outside, after the manner of Pott.

Dec. 31. The fragments were firm, and I substituted the paste bandage for the gutta percha. On the following day he left his bed.

Jan. 10, 1857, he was dismissed from the hospital. The limb seemed perfect, except that it was shortened rather less than half an inch.

CASE 59. *Simple fracture. Result imperfect.*

Michael Dolen, æt. 26, broke his left leg by a fall, May 15, 1853. Fracture of both bones, three inches above the ankle.

Drs. P. and G. were at first employed. A splint was secured to each side of the limb, and the leg was then laid upon a pillow, upon its back.

At the end of two weeks, he was sent to the Hospital of the Sisters of Charity, and was placed in Dr. W.'s ward.

April 7, 1854, nearly one year after the accident, Dolen consulted me, at my office. The limb was shortened half an inch. The lower end of the upper fragment projected in front three-quarters of an inch, and the lower part of the leg and foot had fallen back out of line about 10°. It was also slightly inclined to the fibular side. The fibula was thrown towards the tibia at the seat of fracture. The leg was as useful as before, except that he could not run as fast.

CASE 60. *Simple fracture. Result imperfect.*

John Granger, of Hungerford, England, æt. 43, was tripped by a stone while walking, breaking his right leg, through its lower third. Fracture simple and oblique. It was treated by Richard Barker, surgeon, of Hungerford, England. He employed only side splints.

Two years after, I found the leg shortened one inch, the upper fragment riding upon the front and inner side of the lower fragment.

CASE 61. *Simple fracture. Result imperfect.*

Mrs. Hoyt, of Canaan, Conn., æt. 33, fractured her left leg through its lower third. The limb was treated by Dr. Plumb, of the same place.

Forty years after the accident occurred, Oct. 28, 1852, I found the leg shortened half an inch, and the whole limb, below the fracture, much bent inwards. The lower end of the upper fragment projecting, also on the inside of the lower fragment. The ankle has always remained quite stiff.

Mrs. Hoyt says, the reason why the bones are not in place is, that "the fracture was oblique, and the doctor could not keep it in place, although he set it three times."

CASE 62. *Simple fracture. Result imperfect.*

Dr. A. G. Bigelow, of Rochester, N. Y., æt. 22, was thrown from a sleigh, breaking both bones of his left leg, through their lower thirds. Fracture simple and oblique. Dr. A. Goldsmith, of Rochester, and now of New York, was employed.

Ten years after, I found the leg shortened half an inch, and to compensate for this, he wore an extra piece of leather under his heel. There was also a slight projection at the seat of fracture. There was no other imperfection in the limb.

CASE 63. *Simple fracture. Result imperfect.*

John Graefe, of Buffalo, æt. 30. A heavy board fell edgewise upon his right leg, Jan. 12, 1856, breaking both bones obliquely, about four inches above the joint. The fragments were displaced, and the lower end of the upper fragment of the tibia was thrown to the fibular side of the lower fragment. It was not carried forwards.

I made powerful efforts, by extension and counter-extension, to bring the fragments into line, but I was unable to do so. I then dressed the limb with a couple of Welch's veneered splints, having carefully padded them, and laid the limb upon its fibular side, upon a pillow; the leg being flexed upon the thigh.

Jan. 19, assisted by Dr. Baker, I removed and reapplied the dressings. From this time until the cure was completed, the limb was very attentively watched, and as often as the bandages became loosened they were tightened or renewed. In five weeks, bony union was complete, and the splints were removed, except that they were to be reapplied at night, for a week or two longer. Soon after this he began to use crutches. The usual swelling of the limb occurred, and his ankle remained stiff for several months, no doubt from the effect of the fracture upon the muscles, for the ankle was never inflamed. The limb was shortened less than half an inch, and the lateral displacement was very inconsiderable.

CASE 64. *Simple fracture. Result nearly perfect.*

Peter Best, of Buffalo, æt. 81. His left leg was caught between his horse and a load of wood, breaking both bones three and a half inches above the joint. Dr. L. was called, and laid the limb on Welch's double inclined plane, applying also lateral splints.

March 1, 1856, the sixth day after the accident occurred, Dr. L. requested me to see the limb with him. It was very neatly and appropriately dressed, and the fragments, having never been much displaced, were now, also, in very nice apposition. The lower end of the upper fragment was, however, slightly overriding the lower fragment, and projecting about three lines.

This treatment was continued, and the fragments united. The bones were pretty firm on the 19th of March (24th day), and very little, if any, ensheathing callus could be felt. On the 28th, the starch bandage was applied.

April 18, he began to walk with crutches, but complained very much of his ankle, as being both painful and stiff. The stiffness continued a long time. The limb is shortened one-quarter of an inch, and the fragments remain as when I first saw it. He walks now without any halt.

CASE 65. *Simple fracture. Result imperfect.*

Wm. A. Hart, of Ct., æt. 15, broke the left tibia and fibula, about four inches above the ankle-joint. The fracture was simple, and the tibia was broken obliquely.

The limb was treated by Dr. Beecher, of Ct.

Oct. 1, 1856, forty-four years after the accident occurred, I find the lower end of the upper fragment of the tibia in front and to the inside of the lower fragment. The displacement in this direction is, however, slight. He says that his leg has shortened a little, perhaps one-quarter of an inch. I cannot now ascertain, as the other leg has been broken also, and is shortened a little.

CASE 66. *Simple fracture. Result imperfect.*

Amos A. Henly, æt. 82. Simple fracture of both bones, about three or four inches above the ankle-joint. Dr. L., of Geneseo, N. Y., was employed.

After one year, I found the limb shortened half an inch.

CASE 67. *Simple fracture. Result nearly perfect.*

James Alden, æt. 25; sailor; while wrestling, Jan. 20, 1856, he broke the left leg near the upper end of the lower third. The skin was wounded, but the wound did not communicate with the fracture.

Dr. W. dressed the fracture, and then sent him to the Marine Hospital.

Jan. 22, Dr. W., as an act of courtesy to me, and that the students of the college might avail themselves of the instruction which the case afforded, requested me to dress the limb. I could feel a very slight jutting of the fragments at the place of fracture. I applied two broad and very carefully padded lateral splints, which I secured in place with a roller. I placed the limb in Pott's position.

On the thirty-second day bony union had occurred, with a shortening of one-sixth of an inch. No deformity. No ensheathing callus.

CASE 68. *Simple fracture. Result imperfect.*

Thomas Flinn, æt. 38. Simple fracture, about three or four inches above the ankle. Dr. F., of Medina, N. Y., was employed as the surgeon.

Two years after the accident, I found the limb shortened one inch and a quarter.

CASE 69. *Simple fracture. Result imperfect.*

Thomas Shannon, æt. 40. Simple fracture near the upper end of the lower third. Dr. H., of Buffalo, was employed.

after the accident, May 21, 1850, Shannon called
limb was shortened half an inch, and some bent at
ure.

CASE 70. *Simple fracture. Result imperfect.*

Mrs. Maria Hatchley, æt. 54. Simple fracture, about two inches above the ankle. When I saw her she was under treatment at the New York Hospital. By the politeness of the house surgeon, I was permitted to examine the limb. The bones were united with a shortening of one-quarter of an inch.

CASE 71. *Simpl f ture. R mperfect.*

Hemon Miller, leg about two inches above the ankle. Dr. Beckwith and Prof. James Webster, of Rochester, in attendance.

Ten weeks after the accident, Mil called upon me. The bones were united, but the callus was n. The limb was shortened half an inch.

CASE 72. *Simple fracture. Result imperfect.*

Jonathan Barker, æt. 33, fractured both bones, about two or three inches above the ankle. Fracture simple. Drs. Peter and Abraham Hogaboone, of Castleton, took charge of the case.

Thirty years after, I found the limb not shortened nor deformed, but its muscles were atrophied, and the ankle still remained stiff and tender.

CASE 73. *Simple fracture. Result imperfect.*

John H. Landon, æt. 52. Dr. Josier, of York, Livingstone Co, N. Y., was employed.

Twenty-five years after the accident, I examined the limb. The leg is shortened half an inch. The fragments are united at an angle, the foot and lower part of the leg being inclined to the tibial side; ankle very stiff; enlarged; pains him very much, and more and more every year. His habits are temperate.

CASE 74. *Simple fracture. Result imperfect.*

Elijah Brewster, of Buffalo, æt. 42, fractured his right leg about three inches above the ankle-joint. Fracture simple. Dr. W. in attendance.

Eight years after, I found the leg shortened one-quarter of an inch.

Case 75. *Simple fracture. Result imperfect.*

Elijah Brewster, æt. 50 (same patient as Case 74), broke the left leg about two inches above the ankle.

Dr. B. first dressed the limb, but on the second or third day, Dr. B. requested me to take charge of it.

The limb was united in the usual time, and at the end of three months he was dismissed with a shortening of one-quarter of an inch.

Case 76. *Simple fracture. Result imperfect.*

Ed. M'Donald, of Buffalo, aged about 35 years, broke his leg by the fall of a tree upon it, in 1852. Fracture at the upper end of the lower third. Simple. He was taken to the Hospital of the Sisters of Charity.

Dr. W. in attendance.

Six weeks after the accident occurred, the fragments were united with a shortening of three-quarters of an inch. The upper fragment of the tibia lies in front and to the tibial side of the lower fragment.

Case 77. *Simple fracture. Result imperfect.*

Alvin Vanderhyden, æt. 37, fractured the tibia and fibula about two or three inches from the ankle-joint. Simple.

Dr. Jakeway, of Cayuga Co., N. Y., treated the fracture.

Twenty-five years after, I found the leg shortened half an inch, and the foot, with the lower part of the leg, bent inwards very much.

Case 78. *Simple fracture. Result imperfect.*

Justice Hubbard, of Hamburg, Erie Co., N. Y., æt. 40, had his right leg broken by the fall of a tree. Tibia broken obliquely about two inches above its lower end, and fibula about two inches higher.

The limb was dressed within ten hours after the accident, by Dr. C., of Hamburg. It was already much swollen. Two or three men made extension and counter-extension. Suitable bandages, with three lateral splints, were applied. The splints were made of shingles and binders' board. It was then laid extended upon the bed, without any further dressing, except what might be necessary to support it in position.

After eight years, I examined the limb. He says that its perfect use was not recovered under six months, since which time he has experienced no lameness or inconvenience. The leg is shortened half an inch. The lower end of the upper fragment of the tibia is displaced inwards one-quarter of an inch. The lower end of the upper fragment of the fibula is displaced backwards. A large amount of bony callus remains upon the tibia.

Case 79. *Simple fracture. Result imperfect.*

—— Howard, of Herkimer Co., N. Y., æt. 50, broke the tibia of the right leg at the upper end of the lower third. Fracture oblique. At the same time, also, the fibula was broken three inches above the ankle.

The limb was dressed, and subsequently treated by Dr. D., surgeon in Herkimer Co.

Eighteen years after the accident, I find no perceptible shortening of the limb, but there remains a slight lateral displacement of both bones, at the seat of fracture, and also a backward displacement, by which the foot is thrown a little forwards. During several years he was a little lame, but all lameness has now disappeared.

Case 80. *Simple fracture. Result uncertain.*

June 29, 1848, —— Humphreyville, æt. 35, broke his left leg just above the ankle. Fracture oblique.

I was called soon after the fracture occurred. Assisted by my pupil, Stephen Smith, I reduced the fragments, and having secured them in place with two lateral splints, I laid the limb over a Potter's double inclined plane.

Four months after the limb was firm, and I think without shortening or deformity; I measured the limbs, but I have no record of the fact.

Case 81. *Simple fracture. Result imperfect.*

Asahel Turtelot, æt. 49, broke his left leg near the upper end of the lower third. Fracture simple.

Drs. L. and F., of Lowderdale, Ohio, were employed.

Two years after the fracture had occurred, Turtelot called upon me for counsel, intimating that he intended to sue his surgeons for damages.

I found the limb shortened three-quarters of an inch, and still swollen. I could not discover any error in the treatment to which these results were properly chargeable.

CASE 82. *Simple fracture. Result imperfect.*

Ed. McDonald, about 35 years old, broke the tibia and fibula near the upper end of the lower third, in 1852. On the following day he was admitted to the Hospital of the Sisters of Charity. Dr. W.'s service. The fracture was simple and oblique.

Six weeks after the fracture occurred the bones were united, with a shortening of three-quarters of an inch. The upper fragment overrides the lower; it projects also somewhat to the tibial side.

The limb has been treated with lateral splints, well padded, and without extension, except what could be accomplished through these side splints.

CASE 83. *Simple fracture. Union delayed, &c.*

Wm. C., of B., æt. 47. Mr. C. slipped and fell upon an icy sidewalk, in Jan. 1856, and his right leg coming under his body as he fell, was broken three inches above the ankle. Fracture simple. The tibia was broken obliquely, the direction of the fracture being downwards and inwards. Mr. C. weighed, at the time, about 240 lbs.

H. R., surgeon, of B., Canada, was employed. The limb was dressed with splints made of shingles and underlaid with cotton batting, and it was then placed on a pillow. During the following few days he thinks the inner splint hurt him very much. On about the sixth day the limb was laid over a double inclined plane, and now the heel became very painful, of which pain he was afterward somewhat relieved by lowering the knee.

Eleven weeks after the accident occurred, all dressings were removed.

Aug. 28, 1856, Mr. C. consulted me at my residence in Buffalo. I found the leg shortened three-quarters of an inch, the lower end of the upper fragment being in front of the lower. The lower fragment inclined backwards from the point of fracture down to the foot. The lower part of the limb remained swollen. He was unable to bear his weight upon it.

Mr. C. called my attention especially to what he supposed to be a motion between the fragments of the tibia, and which I at first also supposed did exist; but a more careful examination led me to think that it did not exist; indeed he told me himself that one side firm, but the other moved, a condition of things t be possible. If there was any motion between it was very little, yet it is pretty certain that union W four or five months.

Case 84. *Simple fracture.*

Edward Hutchinson, æt. 27, admitted to the Hospital of the Sisters of Charity, Feb. 8, 1851. Left leg broken just above the ankle. Oblique. Fracture dressed by Dr. Sprague before admission.

I found the limb swollen, and having loosened the dressings I applied straw splints and g and thigh over a double inclined plane.

On the 24th of February he was transferred to the marine ward, under the care of Dr. W. Union took place in about six weeks. Of the precise character of the cure I am uncertain.

Case 85. *Simple fracture. Result imperfect.*

Capt. Thompson, of Buffalo, æt. 30, fell on board his vessel, July 14, 1855, breaking his right leg about four inches above the ankle. Fracture simple and oblique.

Dr. B., of Chicago, first dressed the limb, with a splint fitted to the back of the leg. The leg was allowed to rest upon its back. On the third week he came under my care. I found the bones, Aug. 5th (twenty-first day), united, but with a slight overlapping and bend. I dismissed him at the end of about four weeks more, with the limb in the same condition, as to length, &c., as when I first saw him.

Case 86. *Simple fracture. Result imperfect.*

Joseph Hampshire, of Livingstone Co., N. Y., aged about 83 years, fractured the right leg two inches above the ankle-joint, some time near the last of May, 1850. Fracture simple and nearly transverse. The soft parts were much bruised and the limb soon became excessively swollen.

Dr. R., of Dansville, made the first dressing, assisted by Drs. E. and B. The dressings applied were an eighteen-tailed bandage, pasteboard splints, and Hutchinson's splints. On the following day Dr. E. took charge of the patient, and continued the same dressings until the tenth day, when he substituted for Hutchinson's splints "Jarvis's adjuster." On the sixteenth or seventeenth day, the limb showing a constant inclination to rotate outwards, it was again carefully brought into position. No union of the fragments had occurred. Drs. E. and P. were then in attendance. On the twentieth day Dr. R. resumed his charge of the patient, and continued in charge until the close of the treatment. It resulted in a union, after much delay and suffering. A deep ulcer on the back of the heel.

In April, 1852, about two years after the accident occurred, I examined the leg.

The bones were united without shortening, but with a slight deformity; the leg being bent laterally from the point of fracture. I could not see that he limped when walking, and he seemed to step firmly and freely. I was told, however, that he trod a little upon the outside of his foot.

CASE 87. *Compound fracture. Result perfect.*

Walter Smith, of Pontoosac, Mass., æt. 9, broke his right leg near the ankle, in Oct. 1841. The fracture was compound.

I reduced the fracture and applied lateral splints, laying the limb upon its outer side. Three months after a fragment of bone exfoliated of the size of a twenty-five cent piece, and the wound then closed.

One year from this date the limb was sound, straight, and without any discoverable shortening.

CASE 88. *Compound fracture. Result perfect.*

John Delaney, æt. 11. Oct. 25, 1855, his right leg was traversed by an empty railroad car, breaking both bones near the upper end of the lower third. The fracture was compound.

Dr. Lay and myself in attendance.

We found the fragments of the tibia very movable, but not much displaced. Having secured a carefully padded splint to the fibular side of the limb, we laid it upon a pillow, resting upon its outside and slightly flexed.

With unimportant modifications, this constituted the treatment to the close. Pretty extensive suppuration ensued, and a spontaneous opening occurred on the outside of the limb at an early day. Finally, however, the wounds healed, and bony union was consummated without either shortening or deformity. The bones were united in four weeks.

CASE 89. *Compound fracture. Result perfect.*

Cornelius Ecker, of Nunda, N. Y., æt. 38. The wheel of a railroad car passed over his right leg, breaking both bones at the upper end of the lower third. Compound fracture. The integuments covering the heel were torn off at the same time. He was placed under the care of a surgeon in Nunda.

Jan. 1854, one year after the accident, he became an inmate of the Buffalo Hospital, for the treatment of an ulcer upon the heel, which had remained ever since the injury was received.

I found the bones of the leg united without shortening. The lower end of the upper fragment was displaced backward about three lines. I could not detect any ensheathing callus.

CASE 90. *Compound fracture. Result perfect.*

Wm. Harrington, æt. 32, broke both bones of the leg about three or four inches above the ankle. Fracture compound. Dr. Dieffendorf, of Herkimer Co., N. Y., was employed.

Twenty-two years after, the limb was perfect.

CASE 91. *Compound fracture. Result imperfect.*

Henry Donegan, of Buffalo, aged about 30 years. Fracture of tibia and fibula near the upper end of the lower third. At the Buffalo Hospital of the Sisters of Charity.

March 5, 1853, I removed all dressings. The lower end of the upper fragment is in front and to the fibular side of the lower. The limb is shortened one inch. Bony union was at this time complete, and there was no ensheathing callus which could be felt.

CASE 92. *Compound fracture. Result imperfect.*

Wm. A. Hart, æt. 30, fractured the right leg three inches above the ankle. Tibia projected through the skin. Fracture of tibia oblique.

The fracture was treated by Dr. Walworth, of Fredonia, N. Y.

Twenty-nine years after the fracture occurred, the seat of fracture in both bones could be plainly traced, but I could not discover any displacement. He assured me, however, that it was a little shortened; perhaps one quarter of an inch.

The left leg had been broken fifteen years before, and it had always remained shorter than the right until after the right leg had been broken also, and they were now of the same length.

The ankle of this leg had occasionally been painful.

CASE 93. *Compound fracture. Result imperfect.*

Edward Rubens, of Buffalo, æt. 14, broke his left leg, July 15, 1853, by jumping from a height of eight or ten feet, and striking on his feet.

Dr. Mixer was immediately called, and dressed the limb temporarily. On the same day I was, by Dr. Mixer's request, associated with him in the charge of the case.

I found the leg broken near the upper end of the lower third. The tibia was broken obliquely; opposite the seat of fracture, but on the inner side, was a wound about one inch in length, which was gaping, and through which the end of the upper fragment could be seen, denuded of its periosteum and roughened. It was still bleeding a little.

We laid the limb over a double inclined plane, and secured the foot so as to make extension and counter-extension as much as was practicable: applying at this time no lateral splints or other dressings. The limb was then covered with cloths moistened with cool water.

July 16, we substituted irrigations for the wet cloths. After a few days, the swelling having abated, lateral splints were applied, and still later, the paste bandage was substituted for the lateral splints.

Aug. 20, we opened the paste bandage and found the fragments united, but the wound in the flesh had not entirely closed.

Sept. 2, it is recorded in my notes that the wound was closed, the projection of the upper fragment could scarcely be discovered; the limb was straight, shortened one-quarter of an inch, and there was ensheathing callus to be seen or felt.

One year later I found the shortening the same, but the limb did not appear so straight as at first, and the projection of the upper fragment in front of the lower was more distinct. The parents thought I permitted him to walk too soon, and that this had occasioned the change, but I think the change consisted in the disappearance of all of the fibrinous effusion which had concealed the deformity.

He walks without any halt or impediment.

CASE 94. *Compound fracture. Result imperfect.*

J. O'Bryan, æt. 26. Fracture compound, and at a point about three or four inches above the ankle.

O'Bryan was treated at the Bellevue Hospital, New York. One small fragment of bone exfoliated.

Five months after the fracture occurred, I found the bones united and the limb shortened three-quarters of an inch.

CASE 95. *Compound fracture. Result imperfect.*

Pat. Burke, æt. 26, broke both bones of right leg near the upper end of the lower third, Oct. 18, 1850. Fracture compound.

Dr. G., of Cattaraugus Co., N. Y., was employed. Patient was eleven weeks in bed.

March 16, 1851, five months after the accident, he was received into the Buffalo Hospital with an inflamed ulcer over the seat of fracture. Ulcer one inch in diameter. Leg shortened half an inch. Fragments united at an angle which is salient forwards. The left leg is œdematous.

CASE 96. *Compound fracture. Result imperfect.*

Michael Fellinger, æt. 24, fractured his left leg in April, 1852. Fracture compound: near the upper end of the lower third.

He was attended by a regular surgeon.

Three months after the accident, he was admitted to the Buffalo Hospital of the Sisters of Charity. The fragments were then united, with the lower end of the upper fragment projecting in front; the lower part of the leg, with the foot, falling backwards. The skin is very tender and painful over the projecting bone, and threatens ulceration. He is in good health.

CASE 97. *Compound fracture. Result imperfect.*

George W. Buffon, æt. 33, fractured both bones within three or four inches of the ankle. Fracture oblique and compound. I dressed the limb with side splints and laid it over Rose's double inclined plane, securing the foot to the footboard, and making as much extension as I could.

One year after the fracture, I found him at work, but limping badly in consequence of the swelling and tenderness which still remained about the ankle-joint. He said the leg was not shortened, but on measuring I found it shortened half an inch.

CASE 98. *Compound fracture. Result imperfect.*

A. Rogers, æt. 30, broke the right tibia and fibula, in 1846. Fracture at the upper end of the lower third. Compound. He was taken to the New Orleans Charity Hospital, and placed under the care of Dr. Stone.

Dec. 27, 1848, Rogers was admitted to the Buffalo Hospital of the Sisters of Charity, for the treatment of an intractable ulcer, situated over the point of fracture. He says he remained in bed at the New Orleans Hospital, two months, when the bones were united, and the wound in the soft parts was healed.

Six months ago he hurt the scar, and an ulcer was rapidly formed, which has never again been closed.

On measuring the leg I found it shortened, by overlapping, half an inch. Manifest projection at seat of fracture and directly under the ulcer.

Feb. 12, 1849, he was dismissed with the ulcer nearly, but not entirely, healed.

CASE 99. *Compound fracture. Result imperfect.*

Willard Clark, æt. 14, of Evans, Erie Co, N. Y., fell under a loaded wagon, lacerating and breaking his right leg. The skin was removed from the leg quite extensively.

Dr. Aldrich, a very clever young surgeon, of Evans, had charge of the lad.

Aug. 16, 1848, two weeks after the accident, I was called by request of Dr. Aldrich. I found the limb suppurating freely, and resting upon a canvas very ingeniously suspended within a fracture-box. I saw no occasion to make any change in the plan of treatment.

Seven years from this time the leg was shortened one inch, and the lost integument was not completely repaired. It was still discharging matter.

In 1856, a friend informed me that the sore had finally healed. He walks with a slight halt.

CASE 100. *Oblique compound fracture. Result imperfect.*

Lewis Dodge, æt. 31. Right leg broken in 1831, by the fall of a piece of timber upon the top of the knee. Fracture at the upper end of the lower third, oblique and compound, the tibia projecting through the skin nearly an inch.

The fracture was reduced by Dr. Sydney H. Blossom, of Durhamville, Oneida Co., N. Y., within five hours after its occurrence. Three or four efforts were made, and it required the strength of four men, to accomplish the reduction. During the first four days, Hutchinson's splint was employed, for the purpose of making extension and counter-extension; after which small side splints were substituted and a double inclined plane. This treatment was continued six weeks. An ulcer occurred on the heel from pressure against the splint.

I examined the limb fifteen years after the accident, and found it shortened half an inch, with a slight lateral displacement of the bone. He had himself supposed the limb not shortened. The limb was, in other respects, perfect.

CASE 101. *Compound fracture. Abscess of tibia and amputation, after twelve years.*

Col. D., of Quincy, Chautauque Co., N. Y., æt. 40, was run over by a carriage, in 1844, breaking both bones of the left leg a little above the ankle. Dr. Stockton, of Pa., was employed. The fracture was compound. The fragments united in the usual time, and with but little deformity, but the pain and swelling continued, and finally suppuration ensued. After many years of suffering, I amputated the leg near its middle, in Aug., 1856. I found the tibia inflamed and expanded, from the joint to about five inches above, and containing an abscess large enough to hold three ounces of pus. There were two large openings leading from it to the surface, but it contained no dead bone. He now recovered rapidly.

CASE 102. *Compound comminuted fracture. Result imperfect.*

Christian Schaeffer, of Buffalo, æt. 32, was kicked by a horse, while sitting in his buggy, May 29, 1854, breaking his right leg four inches above the ankle. He was also immediately thrown from his carriage, and the wheels passed over the thigh of the same side, bruising it severely. A wound existed opposite the fracture of the tibia, which was evidently made by the cork of the horse's shoe, and this bone was so comminuted that I was able to remove with my fingers five or six small fragments, and other partially detached fragments were permitted to remain. The wound bled freely.

I dressed the wound with lint, and supported the limb with splints and junks on all sides, and laid it in a box. Subsequently I applied a paste bandage. Complete bony union was not effected until about twelve weeks after the accident. The loose fragments which I permitted to remain were not exfoliated. At no time in the progress of the case could I detect ensheathing callus. The wound was kept almost constantly covered and compressed by bandages and compresses, to which, in some measure, I attribute the favorable issue.

Aug. 22, 1856, nearly two years after the accident, I found the limb shortened half an inch, the upper fragment lying a little on the fibular side of the lower. His limb is as useful as before.

CASE 103. *Compound comminuted fracture. Result imperfect.*

Christian Shoemaker, æt. 50. Compound comminuted fracture, produced by the fall of a piece of timber upon it. Right leg. Three or four inches above the ankle.

Fracture of tibia very oblique, so that a sharp point projected about one-eighth of an inch. Another small wound was made by another small fragment, which was not completely detached from the soft parts.

He had had indolent ulcers on the same leg for two years.

Dr. J., of Buffalo, saw and dressed the fracture within two hours. He placed the limb in a swing splint, and applied cold water dressings. Extension and counter-extension were made from the extremities of the splint. On the seventh day pasteboard splints were applied, and the limb was again laid in the splint. The bandages were now permitted to remain undisturbed two or three weeks, the limb resting constantly on its back upon a sacking.

When united, the limb was found to be shortened half an inch. There was an ulcer on the back of the heel, and the limb was considerably bent at the seat of fracture, so that the foot and lower part of the leg fell backwards.

CASE 104. *Compound comminuted fracture. Result imperfect.*

John B. Foot, æt. 39, fractured both bones of the left leg, about two inches above the ankle-joint. Fracture compound and comminuted. Produced by being thrown from his carriage when his horses were running, his leg being caught in the wheel.

Dr. Bissel, of Genesee, N. Y., was employed. The contusion was so great that it was found impossible to use extension, or to apply anything but the most simple dressings. The limb was laid in a box, and carefully supported. Several fragments of bone were loosened and detached, including, finally, the malleolus internus. His recovery was slow and tedious.

I examined the limb six years after the accident occurred, and [illegible] ned one inch, and quite crooked. It is still, at times, [illegible] pecially when he uses it much.

[illegible] *Compound comminuted fracture. Both legs. Result imperfect.*

John Curran, æt. 23. Left leg broken near the ankle. (See Case 40, middle third.)

CASE 106. *Compound comminuted fracture, complicated with other severe injuries. Result imperfect. Resection of projecting bone.*

July 26, 1853, James A. Manley, æt. 30, was caught in the machinery of a steam [illegible], brea [illegible] is right leg at the upper end of the lower third. [illegible] wo [illegible] e skin opposite the fracture was three-quarters of an [illegible] ı, and a small fragment of the tibia could be felt loose [illegible] skull was also fractured near the superior angle of the occipital bone, and a large wound in the scalp communicated with this fracture. After the injury, he remained for some time unconscious.

Drs. Strong and Hawley were called, and subsequently I was added to the council. We found his consciousness returning, and as the skull was only very little depressed at the point of fracture, we did not trephine, but dressed the wound with simple cerate. The fragments of the tibia overlapped, and we were unable to replace them completely. The leg was also so much bruised and lacerated, that we hesitated whether we ought to make any attempt to save it. It being determined, however, that the attempt should be made, we dressed the wound and supported the limb with well-cushioned splints, with moderate bandages, and laid it upon a pillow. Cool water irrigations were then directed to be made constantly.

Aug. 5, we dressed the limb with a paste bandage, and laid it over a double inclined plane.

Aug. 25, we found the tibia projecting at the wound, and having placed him under the influence of chloroform, I removed, with a chain saw, about half an inch of the bone. We were still, however, unable to make the bone resume its place completely, although it was sufficiently shortened; yet it no longer projected beyond the skin. The consolidation of the bones and the closure of the wound now went on rapidly, and it has, finally, been cured, with a shortening of half an inch. The lower end of the upper fragment projects considerably in front, but, at the end of a year, the limb seems as strong and as useful as ever.

I especially remarked in this case, the value of the paste bandage in diminishing the swelling. Although it was applied over suppurating wounds, and the limb was completely encased for several days, yet by its uniform and steady support, it gave great relief to the patient, and very much diminished the swelling.

CASE 107. *Compound fracture. Resulting in amputation on the fifteenth day.*

Mark Sullivan, æt. 40; at the Buffalo Charity Hospital. Fracture near the upper end of the lower third of the leg. Compound. An attempt was made to save the limb, but amputation became necessary, on the fifteenth day. The patient recovered.

CASE 108. *Compound comminuted fracture, complicated with severe contusion, &c. Amputation on the thirty-fourth day, and recovery.*

Mary, daughter of John Gibbons, æt. 5, was caught under the rollers upon which a small frame house was being moved, July 16, 1853, crushing one of her legs.

Dr. Mixer, of Buffalo, was called. On the following day, I was requested to see the case with him. The foot and leg were greatly swollen and very much discolored, and in addition to the severe injury done to the foot, the leg was broken near its lower end.

No splints were applied. For a time we entertained some hope of saving the entire limb, but eventually, the foot sloughed off, and also the skin of the leg to within four inches of the knee.

Aug. 19, 1853, assisted by Drs. Mixer and Boardman, I amputated just below the knee. Her recovery has been complete.

CASE 109. *Compound comminuted fracture. Excision of the protruding bone, on the nineteenth day. Result imperfect.*

Wm. Smith, æt. 49, on the 4th of July, 1839, fell from the stage of a building, in the town of Cortlandville, and broke his left leg, just above the ankle. The bone was thrust through a thick boot leg, and came in contact with the ground, producing a compound comminuted fracture. It was set and dressed by Dr. S. The man had been for a long time grossly intemperate. The weather, at the time, was extremely warm. On the 5th of July, he was placed under the care of Drs. H. and G., who laid the limb upon a double inclined plane, confined it with splints, and applied light dressings.

dressed daily, but violent inflammation supervened, ughing, and the lower end of the upper fragment e condition of the patient, with other concurrent seemed to indicate the propriety of an amputation, but the p t objected, and, on the 23d of July, the case was transferred to Dr. S., who removed with the saw one inch of the protruding bone. He finally recovered, but not with a very useful limb. When I examined the limb, several years after the occurrence of the fracture, I found it shortened one inch and a quarter, and through a fistulous opening I ascertained that a sequestrum was contained within the shaft, surrounded by a large mass of callus. It was my opinion that an amputation would yet become necessary, or at least an operation for the removal of the sequestrum.

Some years later I learned, while the patient was an inmate of Auburn State Prison, that the limb still remained diseased.

MALLEOLUS INTERNUS AND FIBULA, ABOVE ANKLE-JOINT.

CASE 110. *Simple fracture. Result uncertain.*

Nicholas Fleek, Centreport, N. Y., æt. 51, called upon me, May 31, 1853, with a fracture of the malleolus internus, and also a fracture of the fibula, three inches above its lower end. The accident had occurred some days before by the fall upon it of a barrel of flour, the chime striking upon the outside of the ankle. The foot was not dislocated. The upper end of the lower fragment of the fibula was inclined against the tibia, and I could not replace it.

I dressed the limb with three straight splints, well supported with junks. I have never seen or heard from him since.

CASE 111. *Simple fracture. Result perfect.*

John Flinn, was hit violently on his leg, Oct. 5, 1854, breaking the fibula a little above the ankle, and separating the malleolus internus from the tibia.

The limb was dressed temporarily and very badly, by an empiric, but on the following day Flinn was received into the Buffalo Hospital. The leg was at that time a good deal swollen, and one of the splints was pressing very uncomfortably upon the external malleolus.

I removed all dressings, and finding the fragments were in place —and I presume they were never displaced—I laid the limb upon a pillow, with a couple of straight board splints outside of the pillow, and supported the whole with tapes.

Oct. 7, not being able to discover any motion or crepitus, I removed the side splints entirely, and simply laid the limb on its side upon a pillow.

Oct. 12, discovered a feeble crepitus, and applied a carefully moulded gutta percha splint. Laid the limb on a pillow, resting on the back of the leg and heel.

Oct. 26, discovered an ulcer on the heel. He had hitherto made no complaint of soreness in the part. Dressed ulcer with ung. basilicon. Fragments united. No shortening or deformity.

CASE 112. *Simple fracture. Result perfect.*

W. S. Mooney, æt. 35. Both legs broken in a threshing-machine. (See Case 30.) Treated upon a double inclined plane.

Examined one year after. No defect in the joint, nor appearance of deformity.

CASE 113. *Simple fracture. Result perfect.*

Mrs. Elizabeth Swartz, of Buffalo, æt. 59, fell, in May, 1854, and broke her right leg. She fell about six feet, striking square upon the bottom of her right foot.

Dr. H. was called, and found the malleolus internus broken off, and the fibula broken three inches above its lower end. He dressed the limb with two side splints, with junks, etc.

Forty-six days after the accident occurred, I was requested to visit the patient in consultation with Dr. H.

The bones were united; the lower fragment of the tibia (malleolus internus) being slightly displaced towards the ankle-joint, and the fragments of the fibula resting against the tibia. The ankle-joint was stiff, and the heel was drawn up, throwing the toes downwards. Ensheathing callus could be distinctly felt on the broken fibula, but none on the tibia.

Feb. 11, 1855, nine months after the accident, she called at my office. She was then able to move the ankle-joint pretty freely. In other respects the limb was as in my previous examination.

CASE 114. *Simple fracture, complicated with a dislocation of the tibia inwards. Result imperfect.*

Jonathan Baker, æt. 33, of Castleton, Columbia Co., N. Y., was struck by a falling tree upon his right leg, breaking the fibula about four inches above its lower end, and carrying away, at the same time, the malleolus internus of the tibia. The tibia was dislocated inwards.

Drs. Peter and Abraham Hogaboon, of Columbia Co., had charge of the limb.

Thirty years after the occurrence of the fracture, Aug. 21, 1852, I examined the limb. It is neither shortened, nor deformed, but it is emaciated, and not as strong as the other. It is also quite tender about the ankle, and in this respect it is worse now than it was a year or so after the accident occurred.

CASE 115. *Simple fracture, with dislocation of tibia inwards. Resulting in great deformity. Prosecution, &c.*

—— Brockway, of Cortland, N. Y., aged about 27 years. Dr. S. in attendance. The dislocation was never reduced, although repeated efforts were made to accomplish its reduction.

After one year, the patient called on me to know whether it could then be reduced. The lower end of the tibia projected inwards about one inch, and the foot was slightly turned out. The fibula was bent inwards against the tibia at the seat of fracture, four inches above its lower end. The motions of the joint were very limited. A prosecution was threatened, but after I had shown the patient a cast of one of my own cases (Case 116), in the same position, he assured me that he was fully satisfied, and would not attempt to prosecute a claim for damages.

It appears, however, from a statement made in the *Boston Medical and Surgical Journal*, vol. 31, pp. 140–2, that the case was tried in the Supreme Court of Cortland Co., N. Y., in May, 1844, and that the jury could not agree upon a verdict.

CASE 116. *Simple fracture, with dislocation of tibia inwards. Result imperfect.*

I. Borland, of Borland's Mills, Erie Co., N. Y., aged 31 years. Mr. B. fell under a rolling log, and dislocated his left tibia inwards, breaking off the internal malleolus. The fibula was also broken, about four inches from its lower end. Dr. Sweetland, an old and experienced practitioner, was soon in attendance, who, with another surgeon, failed, after repeated efforts, to reduce the dislocation.

I saw Mr. B. twenty-four hours after the accident, and immediately proceeded to attempt the reduction. The foot and ankle were somewhat swollen, but not very greatly. The skin over the malleolus internus was discolored. The lower end of the tibia projected inwards about one inch. We first flexed the leg upon the thigh, and made extension with our hands during several minutes, constantly flexing and extending the foot upon the leg, and the leg upon the thigh, and in every possible way varying the position of the limb. To this mode of procedure we at length added forcible pressure upon the inside of the tibia, near its lower end. We then placed the leg and thigh over a double inclined plane, and securing the limb firmly, we attached a screw to the foot, through a sandal and gaiter, and while the leg was flexed upon the thigh, we renewed the extension. This was continued more or less during half an hour, and meanwhile pressure was made occasionally upon the inside of the tibia, and the position of the foot and leg was, from time to time, slightly varied. The power which we were thus able to apply was very great, yet it did not for one moment produce any sensible impression upon the displaced bone. We continued our efforts for more than an hour, until we were satisfied that the reduction could not be accomplished, and until the patient begged us to desist. Anæsthetics were not then in use, and I am not certain whether Mr. B. was bled or not; but I doubt whether any such means would have increased our chances of success.

Four weeks from this date, Mr. B. walked on crutches; about one year he walked with a cane, and from that time, a period of eight years, he has walked without any support. For a long time he felt a yielding in his ankle, as the weight of his body settled upon this limb, but this gradually ceased, and now he walks without any halt, and as firmly as before the accident.

The tibia still projects inwards about one inch; the foot inclines slightly outwards, and the broken ends of the fibula rest against the tibia, and are there united.

CASE 117. *Fracture, with partial displacement of tibia inwards. Result uncertain.*

—— Ried, of Buffalo, æt. 7, fell from a fence, April 30, 1854. Dr. Leech and myself in attendance. The displacement of the tibia upon its articulation had been reduced before I saw him. The malleolus internus was broken off, and the fibula was broken two inches above its lower end.

We applied a splint and suitable compresses, with bandages.

May 29th he was walking on crutches. I have neither seen him nor heard from him since.

[illegible] *acture, with dislocation of tibia inwards. Result im-*

[illegible] æt. 50, fell from a scaffolding, Oct. 14, 1853, strik[illegible], dislocating the right tibia inwards, and fracturing, at the same [illegible]e, the malleolus internus and the fibula. The fibula was broken about four inches above its lower end. Dr. L. was immediately in attendance, and having reduced the dislocation, he applied Dupuytren's splint. The next day, at the request of Dr. L., I took charge of the patient, assisted by Dr. Pupikofer. In a few days, vesications appeared over the malleolus internus, and we were apprehensive of sloughing. It was in part due to the splint first applied, and in part to the protrusion of the bone in this direction, at the time of the accident. We took great pains afterward to avoid pressure at this point, and throughout the treatment we were extraordinarily attentive and careful.

On the sixth week we removed the dressings, and there was little or no deformity *apparent* upon either side of the limb. But, after the lapse of several months, when the swelling had entirely subsided, which at first (though slight) concealed the defects, considerable deformity was disclosed.

At the end of eighteen months, the tibia projects inwards, and the malleolus is carried a little downwards. The fibula leans against the tibia at the seat of fracture, and the foot inclines outwards. There is also less freedom of motion in the joint, than before the accident. He walks with a slight halt, but his ankle is not tender or painful.

CASE 119. *Simple fracture, with dislocation. Result perfect.*

Mrs. John Murray, of Buffalo, æt. 37, slipped and fell on an icy board, March 15, 1855. Dr. H., her family physician, being called, requested me to be sent for and to take charge of the case.

I found the malleolus internus broken off, and slightly depressed towards the ankle-joint. The fibula was broken three and a half inches above its lower end. This I was able to determine only by pressing on the lower end of the fibula, by which a slight motion was communicated to the upper end of the fracture. There was no crepitus, yet Dr. H. said that he felt crepitus distinctly, when he first arrived. The ankle was already considerably swollen. Mrs. M., who weighed 192 lbs., says that she felt a distinct snap as she fell, and before she struck the ground, and that on attempting to stand up, her foot immediately turned out, and she felt a second snap. She was suffering great pain.

I applied no splints, but only laid the limb on pillows, and directed warm fomentations. The pains becoming more intense, I substituted, after a few hours, cool lotions for the warm fomentations. This soon gave her relief.

March 23, I applied Dupuytren's splint, securing it with a paste bandage.

April 3, I removed all dressings. Union of fragments complete. No ensheathing callus. I cannot discover that the malleolus internus is displaced. The upper fragment of the fibula is thrown towards the tibia.

After a few weeks her recovery was complete.

CASE 120. *Comminuted fracture, complicated with partial dislocation of tibia inwards. Result imperfect.*

Bernard Duffie, æt. 32. June 5, 1854, a very heavy stone fell upon his back and crushed him forwards, breaking the left innominatum (see Fractures of Innominata, Case 6) and the right leg. The malleolus internus of the tibia was broken off, and comminuted. The fibula was broken about two inches above the ankle. The tibia was also slightly displaced inwards. I dressed the limb temporarily with a pillow and side splints, and sent him to the hospital.

Oct. 1, 1854, at the commencement of my service at the hospital, I found the tibia displaced forwards and inwards upon its articulation. The fibula was united with its broken ends resting against the tibia. He had recovered considerable motion in the ankle-joint. An ulcer, which had formed on the back of the heel, was closing up kindly.

MALLEOLUS INTERNUS AND EXTERNUS.

CASE 121. *Simple fracture of malleolus internus, and of malleolus externus. Result uncertain.*

John McDonough, aged about 35, broke both malleoli of the left leg, Nov. 2, 1852.

I was called, and applied a well padded splint of gutta percha to the back of the limb, merely as a means of support in moving the limb.

The fragments united, and I need not say that there was no shortening of the limb; but how long it was before the ankle regained its free motion, I am not able to say.

NOT BROKEN IN THE SAME DIVISIONS.

CASE 122. *Simple fracture of the tibia through the upper third, and of the fibula through its lower third. Result perfect.*

John Williams, æt. 28. Dec. 31, 1853, a load of wood fell upon his right leg, breaking the tibia through its upper third, and the fibula through its lower third. Fracture simple.

Dressed and treated by Dr. W., of Buffalo, until Jan. 11, 1854, when he came under my care at the Buffalo Hospital. Dr. W. dressed the limb on the first day, with pasteboard splints and rollers; and again renewed the dressings on the 7th of Jan. I removed the dressings on the 11th, and finding the fragments in place, I reapplied the same. About the 20th of Jan. I substituted a paste bandage.

Feb. 11, a little more than seven weeks after the accident occurred, I removed all dressings, and found the fragments united without ensheathing callus, and without shortening. Very slight projection of the tibia at the point of fracture.

CASE 123. *Compound fracture. Tibia broken obliquely at upper end of lower third; and fibula about two inches below the upper end (upper third). Result imperfect.*

Mr. ——, of ———, æt. 33, broke his right leg, April 5, 1851, by bracing his feet against the front of his carriage, when his horses were descending a hill rapidly.

Drs. W. N. and A. were present at the first dressing. There was a wound in the skin through which the tibia had been thrust. The fracture of the tibia was very oblique, and situated near the upper end of the lower third, while the fracture of the fibula was about two inches below its head.

A roller was applied to the limb, and over this pasteboard splints, then another roller, and outside of this two lateral wooden splints. The limb was laid carefully on a bed, and properly supported.

Drs. W. and A. subsequently had charge of him, and were constant in their attendance, visiting the patient almost every day, and renewing the dressings as often as was necessary or useful. After a short time a footboard was attached to a wide side splint, in order to support the foot more effectually.

The splints were continued about five weeks, when the bones were found to be united. In seven weeks he began to use crutches, but he could not bear his weight upon the limb within four months.

During the treatment, the knee was always a little flexed, the limb being supported over a double inclined plane of pillows, &c.

One year after, April 17, 1852, Mr. —— called upon me, and I found the leg shortened one inch and a quarter, the upper fragment of the tibia overriding the lower, from which it projects about half an inch. The overriding of the fibula can also be distinctly felt. This leg measures half an inch less in circumference than the other. It pains him occasionally at the seat of fracture, and the ankle remains rather stiff.

TIBIA AND FIBULA.

UPPER THIRD.											
							RESULT.				
No.	Age when it occurred.	Time since it occurred.	Sex.	Right or left side.	Character of the fracture.	TREATMENT.	United or not.	When united.	Amount of shortening.	Remarks.	Perfect or imperfect.
1	25 y.		M.		Simple; frag. of tibia never displaced.	Gutta percha splint.	U.		none		P.
2	21 y.	5 y.	M.		Simple.		U.		⅜ in.		Imp.
3			M.		Simple.		U.		¼ in.		Imp.
4	35 y.	4 m.	M.	R	Simple.	Lateral splints, &c.	D. U.	119 d.	¼ in.	Slight forward projection of upper fragment of tibia.	Imp.
5	39 y.	6 y.	M.	R.	Simple.		U.		1¼ in.	Tibia bent back at seat of fracture; anchylosis of knee (partial).	Imp.
6	30 y.	40 d.	M.	L.	Compound.	Felt splints and double inclined plane.	U.		none	Result uncertain; (see case).	
7	25 y.	5 y.	M.	R.	Simple and comminuted.		U.			Result uncertain; (see case).	
8	34 y.	8 y.	M.		Compound.		U.		⅜ in.	Tibia bent at seat of fracture.	Imp.
9	50 y.	28 m.	M.		Compound comminuted.	Side splints, box, starch bandage, &c.	U.	63 d.	¾ in.	Several fragments removed.	Imp.
MIDDLE THIRD.											
10	38 y.	36 d.	M.		Simple.	Paste bandage.	U.	35 d.	none		P.
11	16 y.		M.		Simple; frag. of tibia never displaced.		U.		none		P.
12	17 y.	40 d.	M.	L.	Simple oblique of tibia.	Double inclined plane; paste bandage, &c.	U.	40 d.	none		P.
13	10 y.	15 y.	M.	L.	Simple.		U.		none		P.
14	19 y.		M.		Simple; tibia transverse.	Paste bandage.	U.		none		P.
15	15 y.	27 d.	M.	L.	Simple; tibia oblique.	Gutta percha and double inclined plane, &c.	U.	21 d.	none	Straightened on 21st day.	P.
16	20 y.	2 y.	M.		Simple.		U.	22 d	none	Ankle occasionally painful.	P.
17	31 y.	6 w.	M.	R	Simple; frag. of tibia never displaced.	Paste bandage, &c.	U.	42 d	none		P.
18	70 y.	4 w. & 5 d.	M.	L.	Simple.	Side splints, &c.	U.	33 d.		Lower fragment of tibia slightly in front of upper.	
19	63 y.	4 m.	M.		Simple.		U.		none	Ulcer over point of fracture after 4 mos.	P.
20	30 y.	5 w.	M.	L.	Simple; frag. of tibia never displaced.		U.		none		P.
21	14 y.	5 w. & 2 d.	M.	L.	Simple; tibia transverse; fragment of tibia never displaced.	Paste bandage.	U.	40 d.	none		P.
22	41 y.	3 m.	M.	L.	Simple; tibia oblique; broken by muscular action; frag. of tibia never much displaced.	Copper splints; laid in Pott's position.	U.		none		P.
23	38 y.	8 m.	M.		Simple.	Paste bandages, &c.	U.		¼ in.	Lower frag. of tibia in front of upper; unable to walk without crutches after 8 months.	Imp.

TIBIA AND FIBULA.

MIDDLE THIRD—*Continued.*

No.	Age when it occurred.	Time since it occurred.	Sex.	Right or left side.	Character of the fracture.	TREATMENT.	RESULT. United or not.	When united.	Amount of shortening.	Remarks.	Perfect or imperfect.
24	18 y.	16 d.	F.		Simple; tibia oblique.	Paste bandage, &c.	U.	48 d.	¾ in.	Upper frag. of tibia in front of lower.	Imp.
25	25 y.	11 w.	M.		Simple; tibia oblique with concussion of spine.	Side splints and a box.	U.		1 in.		Imp.
26	18 y.	5 m.	F.	R.	Simple; tibia oblique.	Side splints, &c.	U.		1 in.	Upper frag. of tibia upon outside of lower; began to walk in 5 months.	Imp.
27		6 w.	F.	L.	Compound.	Gutta percha side splints; pillow.	U.	42 d.	none	Fistulous discharge after 6 weeks.	P.
28	35 y.	4 m.	M.		Compound.		U.		none		P.
29	65 y.	17 d.	F.	L.	Compound; tibia oblique.	Pott's method 2 weeks, and then double inclined plane; gutta percha.	U.	26 d.	¼ in.	No deformity	Imp.
30	35 y.		M.	R.	Compound (both legs).	Double inclined plane.	D. U.		¾ in.	Frag. of tibia bent forwards; slough on heel at end of 7 weeks.	Imp.
31	25 y.	12 d.	M.	L.	Compound (with other fractures).		U.		¼ in.		Imp.
32	4 y.	23 y.	M.		Compound.		U.		⅛ in.	Paralysis of lower ext. produced by healing ulcer of 22 years, over seat of fracture.	Imp.
33	22 y.	3 m.	M.	L.	Compound; tibia oblique (with other fractures).		U.		1⅛ in.	Upper fragment of tibia in front; ulcer on heel, &c.	Imp.
34	8 y.		M.	R.	Compound; tibia transverse.	Side splint, pillow, cold water, &c.				Died in 3 months.	
35	19 y.	5 w.	M.	R.	Comminuted (both legs); tibia oblique.	Starch bandage, &c.	U.	35 d.		Not crooked; whether shortened or not cannot determine.	
36	14 y.	10 y.	M.	L.	Compound comminuted.		U.		none		P.
37	28 y.	37 d.	M.	L.	Compound comminuted; tibia oblique.	Double inclined plane, &c.; paste bandage after 7 weeks.	U.	56 d.	⅛ in.		Imp.
38	33 y.	3 y.	M.	R.	Compound; tibia transverse.	Mayor's dressing, cool lotions, a box, &c. &c.	U.		¼ in.	Upper frag. of tibia in front of lower very much; useful limb.	Imp.
39	48 y.	5 w.	M.	L.	Compound comminuted, with other complications.	Box, paste bandage, and later double inclined plane.	U.	35 d.	⅛ in.	Stiffness in ankle after 9 months.	Imp.
40	23 y.	4 w.	M.	R.	Compound comminuted (both legs); rupture of art.	Side splints; flexed position at first, then box, swing, &c.	U.	28 d.	¾ in.		Imp.
41	20 y.		M.	R.	Compound comminuted: rupture of art.	Gutta percha; wired fragm'ts together.				Died on 5th day.	
42	31 y.	7 w.	M.	R.	Compound, with fracture of femur of same side.	Straight splint.	U.		¼ in.		Imp.
43	40 y.		M.	R.	Compound comminuted.	Box, cool water, &c.	N. U			Gangrene; amputation on 13th day; death on 16th day.	
44	32 y.		M.		Compound comminuted.	Box, side splints, &c.	U.		¾ in.	Slightly bent at seat of fracture.	Imp.

TIBIA AND FIBULA.

LOWER THIRD.

No.	Age when it occurred.	Time since it occurred.	Sex.	Right or left side.	Character of the fracture.	TREATMENT.	RESULT.				
							United or not.	When united.	Amount of shortening.	Remarks.	Perfect or imperfect.
45	42 y.	24 y.	M.	L.	Simple; from muscular action; never displaced.	Carved splints.	U.		none		P.
46	25 y.	4 m.	F.	R.	Simple; tibia oblique; from muscular action; not much displaced.	Gutta percha, pillow, &c.	U.		none		P.
47	14 y.	8 y.	M.	R.	Simple; tibia oblique.		U.		none		P.
48	34 y.	1 y.	M.	R.	Simple; tibia transverse; not displaced; upper end of fib. in place, but lower end inclined to tibia.	Pasteboard-splints and rollers.	U.		none		P.
49	44 y.	2 m.	M.	R.	Simple; tib. obliquely down. and in.; only slightly displaced.	Gutta percha and a pillow	U.		none		P.
50	14 y.	21 y.	M.	L.	Simple; transverse.	Tin splints.	U.		none		P.
51	25 y.	32 d.	M.		Simple; tibia oblique; no displacement.	Starch bandage.	U.	28 d.	none		P.
52		6 m.	M.		Simple.	Side splints.	U.		none		P.
53	15 y.	6 w.	M.		Simple.		U.		none	Slight outward projection of tibia at seat of fracture.	P.
54	7 y.	1 m.	F.		Simple oblique	Pasteb'd splint; double inclined plane.	U.	28 d.	none		P.
55			F.		Simple; tibia transverse.	Straw junks, &c.	U.		none		P.
56	17 y.		M.		Simple; tibia oblique.	Gutta percha splints.	U.		none	Slight bend of tibia at seat of fracture.	P.
57	6 y.	4 m.	M.		Simple.		U.		none		P.
58	40 y.	1 m.	M.	L.	Simple; tibia oblique down and back.	Gutta percha, Pott's position, &c.	U.	26 d.	⅛ in.	Upper fragment of tibia in front.	Imp.
59	26 y.	1 y.	M.	L.	Simple.	Splints; limb laid upon its back.	U.		¼ in.	Upper frag. of tibia in front; heel fallen backwards and outwards; fibula inclined against tibia.	Imp.
60	43 y.	2 y.	M	R.	Simple; tibia oblique.	Side splints.	U.		1 in.	Upper frag. of tibia on front and inner side of lower.	Imp.
61	33 y.	40 y.	F.	L	Simple; tibia oblique.		U.		¼ in.	Upper frag. of tibia on inner side of lower; foot inclined in; ankle stiff.	Imp.
62	22 y.	10 y.	M.	L.	Simple; tibia oblique.		U.		⅛ in.	Slight projection at seat of frac. of tibia.	Imp.
63	30 y.		M.	R.	Simple oblique.	Side splints and Pott's position.	U.	35 d.	⅓ in.	Upper frag. of tibia on outside of lower very slightly.	Imp.
64	31 y.	2 m.	M.	L.	Simple.	Welch's double inclined plane, starch bandage, &c.	U.	24 d.	½ in.	Upper frag. of tibia slightly in front of lower.	Imp.
65	15 y.	44 y.	M.	L.	Simple; tibia oblique.		U.		¼ in.	Upper frag. of tibia in front and inside of lower.	Imp.
66	82 y.	1 y.	M.		Simple.		U.		¼ in.		Imp.
67	25 y.	2 m.	M.	L.	Simple.	Lateral splints; Pott's position.	U.	32 d.	1-6 in.		

LOWER THIRD—*Continued.*

No.	Age when it occurred.	Time since it occurred.	Sex.	Right or left side.	Character of the fracture.	TREATMENT.	RESULT.				
							United or not.	When united.	Amount of shortening.	Remarks.	Perfect or Imperfect.
68	38 y.	2 y.	M.		Simple.		U.		1¼ in.		Imp.
69	40 y	2 m.	M.		Simple.		U.		½ in.	Slightly bent at seat of fracture of tibia.	Imp.
70	54 y.		F.		Simple.	Lateral splints; limb laid upon its back.	U.		¼ in.		Imp.
71	43 y.	10 w.	M		Simple.		D. U.		½ in.	Callus not firm in 10 weeks.	Imp.
72	33 y.	30 y	M.		Simple.		U.		none	After 30 years ankle stiff and tender, and muscles atrophied; no shortening or deformity.	Imp.
73	52 y	25 y	M.		Simple.		U.		½ in.	Foot inclined out; ankle stiff, enlarged, painful.	Imp
74	42 y.	8 y.	M.	R.	Simple.		U.		¼ in.		Imp.
75	30 y.	3 m.	M.	L.	Simple.		U.		¼ in.		Imp.
76	35 y	6 w.	M.		Simple.		U.		¾ in.	Upper frag. of tibia on front and inner side of lower.	Imp.
77	37 y.	25 y.	M.		Simple.		U.		½ in.	Foot and lower part of leg inclined in.	Imp
78	40 y.	8 y.	M.	R.	Simple; tibia oblique.	Side splints; straight position on back.	U.		½ in.	Upper frag. of tibia on inside of lower; upper frag. of fibula falls back; much callus.	Imp.
79	30 y.	18 y.	M.	R.	Simple; tibia oblique.		U.		none	Lower part of leg inclined forwards and inwards.	Imp.
80	35 y.	4 m.	M.	L.	Simple; tibia oblique.	Double inclined plane.	U.			Precise result unknown.	
81	49 y.	2 y.	M.	L.	Simple.		U.		¾ in.	Limb swollen after 2 years.	Imp
82	45 y.	6 w	M.		Simple; tibia oblique.	Lateral splints.	U.		¾ in	Upper frag. of tibia on inside of lower.	Imp.
83	47 y.	7 m	M.	R.	Simple; tib. obliquely down and in.	Lateral splints; double inclined plane.	D. U.	120 d.	¾ in.	Upper frag. of tibia in front of lower; lower part of limb falls back; after 7 months it is swollen and patient is unable to walk.	Imp.
84	27 y.	6 w.	M.	L.	Simple; tibia oblique.	Straw side spl'ts; double inclined plane.	U.			Precise result unknown.	
85	30 y.	7 w.	M.	R	Simple; tibia oblique.	Carved splint; laid limb on back.	U.	21 d.	¼ in.	Slight bend at seat of fracture.	Imp.
86	33 y.	2 y	M.	R.	Simple; tibia transverse.	Hutchinson's splints; Jarvis's adjuster.	U.		none	Ulcer on heel; lower part of leg inclined in.	Imp.
87	9 y.	1 y	M.	R.	Compound and comminuted.	Lateral splints; Pott's position.	U.		none	Frag. of bone exfoliated after 3 mos.	P.
88	11 y.	1 m.	M	R.	Compound; frag of tibia not much displaced.	Pott's position, &c.	U.	28 d.	none		P.
89	35 y.	1 y.	M.	R.	Compound.		U.		none	Upper frag. of tibia slightly displaced backwards; ulcer on heel from extensive laceration.	P.
90	32 y.	22 y.	M.		Compound.		U.		none		P.
91	30 y.		M.		Compound.		U.		1 in.	Upper frag. of tibia on front and outside of lower	Imp.
92	30 y.	29 y.	M.	R	Compound; tibia oblique.		U.		¼ in	Ankle occasionally painful after 29 yrs	Imp

TIBIA AND FIBULA.

LOWER THIRD—*Continued.*

No.	Age when it occurred.	Time since it occurred.	Sex.	Right or left side.	Character of the fracture.	TREATMENT.	RESULT.				
							United or not.	When united.	Amount of shortening.	Remarks.	Perfect or imperfect.
93	14 y.	1 y.	M.	L	Compound; tibia oblique.	Double inclined plane; paste bandage, &c.	U.	36 d.	½ in.	Upper frag. of tibia in front of lower.	Imp.
94	26 y.	5 m.	M.		Compound.		U.		¾ in.	Small frag. of bone exfoliated.	Imp.
95	26 y	5 m.	M.	R.	Compound.		U.		¼ in	Lower part of limb falls back; ulcer over seat of fracture after 5 months.	Imp.
96	24 y.	3 m.	M.	L.	Compound.		U.			Upper frag. of tibia in front of lower; lower part of limb falls back.	Imp
97	33 y.	1 y.	M.		Compound; tibia oblique.	Double inclined plane, with extension.	U.		¼ in.	Ankle swollen and painful after 1 year.	Imp.
98	30 y.	3 y.	M.	R.	Compound.		U.		¼ in.	Some projection of tibia at seat of fracture; ulcer at same point after 3 years.	Imp.
99	14 y.	7 y.	M.	R.	Compound.	Suspension in a box.	U.		1 in.	Ulcer healed after 8 years.	Imp.
100	31 y.	15 y.	M.	R.	Compound; tibia oblique.	Hutchinson's splints, &c. &c.	U.		½ in.	Ulcer on heel; slight lateral displacement of tibia.	Imp.
101	40 y.	12 y.	M.	L	Compound.		U.		none	An abscess formed in the tibia, and amputated after 12 yrs.	Imp.
102	32 y.	2 y.	M.	R.	Compound comminuted.	Box; paste bandage, &c.	D. U.	84 d.	¼ in.	Upper frag. of tibia on outside of lower.	Imp.
103	50 y.		M.	R.	Compound comminuted; tibia oblique.	Swing splint, extension, &c.	U.		½ in.	Ulcer on heel; lower part of limb falls back.	
104	39 y.	6 y.	M.	L.	Compound comminuted.	Box, &c.	U.		1 in.	Crooked; after 6 yrs. it is occasionally painful; several fragm'ts exfoliated.	Imp.
105	23 y.	4 w.	M.	L.	Compound comminuted (both legs); rupture of art.	Side splints, &c. (see Case 40).	U.	28 d.	¾ in.		Imp.
106	30 y.	1 y.	M.	R.	Compound comminuted and complicated.	Paste bandage, double inclined plane, &c.; resection of projecting bone on 30th day.	U.		½ in.	Upper frag. of tibia in front of lower.	Imp
107	40 y.		M.		Compound.		N. U.			Amputation on 15th day.	Imp.
108	5 y.		F.		Comp. comminuted, &c.		N. U.			Amputation on 34th day.	Imp.
109	49 y.		M.	L.	Compound comminuted.	Double inclined plane; resection of bone on the 19th day.	U.		1¼ in.	Abscess of bone after several years.	Imp.
LOWER THIRD (MALLEOLUS INTERNUS, AND FIBULA ABOVE ANKLE-JOINT).											
110	51 y.		M.		Simple; fibula broken 3 in. above lower end	Side splints, &c.	U.		none	Lower frag. of fibula inclined against tibia.	
111			M.		Simple: fibula broken a little above ankle.	Various.	U.		none		P.
112	35 y.	1 y.	M.	L.	Simple (both legs broken).	Double inclined plane, &c.	U.		none		P.

TIBIA AND FIBULA.

LOWER THIRD (MALLEOLUS INTERNUS, AND FIBULA ABOVE ANKLE-JOINT)—*Continued.*							RESULT.				
No.	Age when it occurred.	Time since it occurred.	Sex.	Right or left side.	Character of the fracture.	TREATMENT.	United or not.	When united.	Amount of shortening.	Remarks.	Perfect or imperfect.
113	59 y.	9 m.	F.	R.	Simple; fibula broken 3 in. above lower end.	Side splints, &c.	U.		none	Mal. int. displaced down; broken fibula resting against tibia, &c.; ankle some stiff.	Imp.
114	33 y	30 y.	M.	R.	Simple; fibula broken 4 in. above lower end.		U.		none	Limb atrophied after 30 years, and tender about the ankle; neither shortened or deformed.	Imp
115	27 y	1 y.	M.		Simple; fibula 4 inches above lower end.		U.		none	After 1 year, motions of joint limited; tibia unreduced; fragments of fibula fall against tibia; prosecution.	Imp.
116	31 y.	8 y.	M.	L.	Simple; fibula 4 inches above lower end.	Dupuytren's splint, &c.	U.		none	Tibia unreduced; fragments of fibula fall against tibia, &c	Imp.
117	7 y.		M.		Simple; fibula 2 inches above lower end.	Splints, &c.	U.		none		
118	50 y	18 m.	M.	R.	Simple; fibula 4 inches above lower end.	Splints, &c.	U.		none	Foot inclines out; tibia projects on inner side; fragments of fibula rest against tibia.	Imp.
119	37 y.		F.		Simple; fibula 3½ inches ab. lower end.	Dupuytren's splint, &c.	U.	19 d.	none	Upper fragment of fibula falls towards tibia.	P.
120	32 y.	4 m.	M.	R.	Comminuted of tibia; fibula broken 2 in. above ankle.		U.		none	Tibia displaced forwards and inwards; frag. of fibula falls against tibia; ulcer on heel.	Imp.
LOWER THIRD (MALLEOLUS INTERNUS AND EXTERNUS).											
121	35 y.		M.	L.	Simple.		U.		none		
NOT BROKEN IN THE SAME DIVISIONS.											
122	23 y.	7 w.	M.	R.	Simple; tibia in up. ⅓; fibula in lower ⅓.	Splints, paste bandage, &c.	U.		none		P.
123	33 y.	1 y.	M.	R.	Compound; tibia lower ⅓; fibula upper ⅓.	Side splints, double inclined plane, &c.	U.		1¼ in	Ankle stiff, &c.	Imp.

ANALYSIS OF ALL THE CASES OF FRACTURE OF THE TIBIA AND FIBULA.

Of 123 fractures of the leg (tibia and fibula) 9 belonged to the upper third, 35 to the middle third, and 77 to the lower third. In

2 cases the two bones were not broken through the same divisions.[1]

111 were males, and 12 females. 18 were under 16 years of age; 37 over 15 and under 31; 45 over 30 and under 46; 13 over 45 and under 60, and 5 over 60. The extreme limits of age were 4 years and 85; the average of all their ages being nearly 32 years. 76 were simple, and 47 compound, or more or less complicated; the proportion of compound fractures being larger than in the case of any other long bone.[2] 42 are known to have occurred in the right leg and 37 in the left.

The average period of union in 29 cases, including those in which union was delayed beyond the usual time, was 40 days and a fraction over.

Union was delayed in 5 cases, 3 of which were cases of simple fracture and 2 of compound. In one instance the fracture was in the upper third; in one instance in the middle third, and three times in the lower third. The longest period was 17 weeks. In no case, except where amputation or death interposed, did the bones refuse finally to unite.

Of 108 fractures, 37 are marked perfect, and 71 imperfect. 49 are known not to be shortened, and 61 are known to be shortened. The greatest amount of shortening recorded in any case is one inch and a half; and the average shortening of the 61 known to be shortened is $\frac{1}{2}$ an inch and $\frac{25}{244}$ of an inch. The average shortening of 32 simple fractures known to have been shortened is $\frac{1}{2}$ an inch and $\frac{21}{256}$ of an inch. And the average of all the simple fractures, including those not shortened at all, as well as those which are shortened, is $\frac{1}{5}$ of an inch and $\frac{1}{30}$ of an inch, lacking just $\frac{1}{60}$ of $\frac{1}{4}$.

The upper fragment of the tibia has been found more or less in front of the lower, sometimes only very slightly, in 11 cases. In 4 of these cases a double-inclined plane was used; in 3, the limb was dressed either with paste bandages or side splints and laid straight upon its back; in 1, Mayor's plan was adopted, and in 1, Potts'.

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[1] It is very probable, indeed quite certain, that some of the cases recorded as belonging to one division or another, were cases in which the two bones were broken in separate divisions, since it has been found often impossible to determine at what point the fibula was broken. I have been compelled to decide this question upon presumptive rather than positive evidences.

[2] Of 80 cases reported by W. W. Morland, M. D., from the Massachusetts General Hospital, and in which the character of the accident is recorded, 39 were compound, and 41 simple. See article on Fractures in the *Transactions of the Mass. Med. Soc.* for 1840, by A. L. Peirson, M. D.

The upper fragment of the tibia was in front and upon the outside of the lower in 2 cases; in front and upon the inside in 3 cases; upon the outside in 2 cases; upon the inside in 3 cases, and behind the lower fragment in 3 cases.

The limb was more or less inclined backwards, from the seat of fracture downwards, in 5 cases; in two of which the limbs are known to have been treated upon a double inclined plane, and in one the limb was suspended in a box. In all of the cases it is believed that the limbs rested upon their backs during the treatment.

The lower part of the limb was inclined inwards in 5 cases, in four of which cases the treatment is not recorded; in the fifth, both Hutchinson's splint and Jarvis's adjuster were used at different periods of the treatment, with extension; the limb was constantly upon its back.

In Case 73, the lower part of the limb was inclined out; in Case 5, forwards, and in Case 79, forwards and inwards. In not one of these cases is the treatment recorded.

In six other cases there has remained a slight bend at the seat of fracture in the tibia, but its direction is not mentioned. In four of the six, the limbs were laid upon their backs, and in two of the four cases they were in a box.

In all of the seven cases recorded as having been treated by Potts' method, the line of the axis of the limb is preserved.

In five cases, all of which except one, were compound fractures, ulcers were produced upon the heel by the apparatus. In all of these cases the limbs rested upon their backs; over a double inclined in two cases, and upon a single plane in the remainder. In three cases, presenting each of them lateral obliquities of the lower portion of the limb as well as ulcers on the heel, extension and counter-extension were employed, once by Hutchinson's splint alone; once by Jarvis's adjuster and then Hutchinson's splint, and once in a Mayor's apparatus.

I have never seen an ulcer on the heel where Potts' position was adopted.

The ankle-joint has been found painful, occasionally, after one, two, and twenty-nine years; more or less anchylosed after one year, thirty and forty years; both stiff and painful in one case after twenty-five years. Four of these seven cases were compound fractures. None of them belonged to the upper third; one was through the middle third, and six through the lower third; three of these latter being within three inches of the ankle-joint. In Case 97, extension with counter-extension constituted a part of the treatment.

In Case 5, a simple fracture, belonging to the upper third, partial anchylosis of the ankle existed after six years; and in Case 39, a compound fracture of the middle third, the knee and ankle were both somewhat stiff after nine months. Extension with counter-extension constituted a part of the treatment in this latter case.

In Case 19, a simple fracture of the middle third, united without shortening or deformity, an ulcer has existed over the seat of fracture two years, the cause of which I have not ascertained. In Case 32, of compound fracture, the bones having been broken in infancy, an ulcer existed over the point thirty-two years; scales of bone were frequently exfoliated. In Cases 95 and 98 of compound fractures an ulcer existed over the fracture in one case five months, and in the other three years; in both cases the bones (tibias) had united at an angle which was salient forwards under the ulcers.

In Cases 23 and 26, both simple fractures of the middle third, the patients did not walk without crutches until after eight months in the one case, and five months in the other.

In reference to the causes producing these fractures, I have noticed in an analysis of 66 cases, that in the upper third one has been referred to a direct cause and one to an indirect; in the middle third, 27 have been referred to a direct cause and none to an indirect; in the lower third, 29 to a direct cause and 8 to an indirect. An observation which does not exactly sustain the remark of Malgaigne, based upon his analysis of 67 cases, that fractures of the upper third are produced by direct causes alone, those of the middle third much more frequently by indirect causes, and that those of the lower third are especially due to indirect causes. Direct causes, such as fall upon the side of the limb, blows, &c., produce a large majority of the fractures of the lower third, only the proportion is smaller than in the middle third.

I notice also that of the 51 cases of fractures of the leg produced by direct blows, 25 were compound and 26 simple, while of the 4 mentioned as the result of falls upon the feet 2 are compound and 2 are simple. It would appear, therefore, that both causes operate nearly equally in the production of simple or compound fractures.

Three fractures have been produced by muscular action alone; two of which belonged to the lower third and one to the middle. They all occurred in adults; in neither case were the fragments much, if at all, displaced, and all recovered without any shortening or deformity.

Of the 11 fractures of the malleolus internus and of the fibula above the ankle-joint, 6 were the result of falls upon the bottom of the foot, and 5 of direct blows upon the outside of the ankle.

Analysis of the Fractures of the tibia and fibula belonging to the upper third.

All of the 9 fractures belonging to the upper third, occurred in males; of whom the youngest was 21 years, and the oldest 50 years. The average being 31; 5 were simple, and 4 more or less complicated. The treatment was so various as not to deserve especial mention. In one case, union was delayed one hundred and nineteen days. The average shortening of the whole 9 cases is half an inch and $\frac{15}{48}$ of an inch.

Analysis of the Fractures of the tibia and fibula belonging to the middle third.

Of the 35 fractures of the middle third 16 were simple, 18 compound, and 1 comminuted. Several of the compound fractures were also comminuted and otherwise complicated. 31 were males, and 3 females. 10 are known to have occurred in the right leg, and 14 in the left. The ages ranged from 4 years to 70, and averaged 17.

In 4 cases the tibia was found to be broken nearly transversely, and in 10 obliquely. The direction of the fracture not being mentioned in the remainder. In 5 cases the fragments were never at all, or very slightly, displaced.

The average shortening of all the fractures of the middle third is half an inch and $\frac{13}{128}$ of an inch.

In one case union was delayed 7 weeks or more.

Analysis of the Fractures of the tibia and fibula belonging to the lower third, excepting only fractures of the malleoli.

Of the 77 fractures of the lower third, 11 were fractures of the malleolus internus, and of the fibula above the joint, and 1 was a fracture of both malleoli. Rejecting these, 65 remain; of which 42 were simple, and 23 compound, with also, occasionally, other complications. 59 were males, and 6 females. 23 are known to the right leg, and 18 in the left. The ages ranged 35. In 2 cases the fractures were produced by mus- one. In 4 the tibia is known to have been broken tran sely, and in 23 cases obliquely, in 1 of which the obliquity is recorded as downwards and backwards, and in 2 cases downwards and inwards. In the remaining cases the direction of the obliquity is not mentioned.

The average shortening of these cases is one-fifth of an inch, and a small fraction over.

Analysis of Fractures of the malleolus internus, with fractures of the fibula above the ankle-joint.

Of the 11 fractures of the malleolus internus, and of the fibula, above the joint, 9 were males and 2 females. 4 are known to have occurred in the right leg, and two in the left. Their ages ranged from 7 years to 59. Not 1 was compound, 1 was comminuted, and the remainder were simple. In 2 cases the fibula was broken two inches above its lower end; in 2 cases it was broken three inches above; in 1 three and a half inches, and in 3 cases four inches.

Of course, no shortening occurred in either case. In 7 of the cases, the fibula remained displaced inwards towards the tibia, in all of which, save one, some degree of stiffness existed in the ankle-joint. In 4 cases the foot inclined outwards more or less, and the lower end of the tibia projected inwards.

In 2 cases only were the limbs found to be perfect.

TREATMENT.

The leg is subject to a greater variety, and to more frequent complications in its fractures, than any other portion of the body. Without attempting to indicate the special rules which ought to govern us in the treatment of these various accidents, I shall only allude to a few points, which seem to demand especial attention.

It is to these accidents, especially, that the remarks of Dr. Norris, already quoted, are applicable. The large size, and irregular form, of the bones of the leg, the small amount of muscular tissue covering them, especially near the articulations, the severity of the injuries to which they are liable, with their remoteness from the centre of circulation—these circumstances altogether, render them exceedingly exposed to injury from the too great or unequal pressure of splints or of bandages; and it has often occurred to myself, as it has to Dr. Norris, to find the skin vesicated, or even ulcerated and sloughing, when the patients are first admitted to the hospital; a condition which, in nine cases out of ten, is due to the mal-adjustment of the splints, or to the tightness of the bandages. Too much care can never be exercised in the application of the first dressings, nor ought they ever to be permitted to remain longer than twenty-four hours, without being removed, or freely opened, so as to permit an examination of the limb thoroughly on all sides.

As to the position of the limb, it is quite certain that no rule of universal application can be made; a remark, indeed, which might hold true, in some degree, of all fractures, but which is especially true of fractures of the leg; nevertheless, a careful observation of the cases treated under my own eye, has gradually forced upon me a conviction that, in a large majority of cases, Potts' position was greatly to be preferred, viz., flexing the leg upon the thigh, and placing the whole limb upon its outer side. It is only occasionally that, in fractures of the leg, extension and counter-extension can be safely employed; an assertion which, however much it may excite surprise, experience will prove true. In such cases as demand or warrant a resort to extension and counter-extension, a double inclined plane furnishes the most convenient mode for its accomplishment. In nearly all other cases, I prefer Potts' position, which, while it prevents, in some degree, the shortening of the limb, is quite as effectual as any other mode, in preventing the forward displacement of the upper fragment, and less likely to permit a backward or forward displacement of the lower part of the limb, or to give rise to ulcerations; and it is almost always—the limb being supported upon its broadest surface—much more easy and comfortable to the patient. If this position is adopted, the limb ought to be placed upon a broad, well-cushioned splint, extending from a little above the knee, to the end of the foot; but, carefully padded lateral splints, with rollers, &c., are indispensable, as additional means of support to the broken limb.

Boxes are rarely useful, except in certain compound fractures. They are heavy and awkward machines, which prevent the patient from moving readily in bed; or which being fixed, if he does move, allow the upper fragment only to descend, or to move upon the lower, as a fixed point. If used at all, they ought generally to be suspended, or made to move, on a suspended railway.[1] But, however they are arranged, the limb is a great part of the time concealed from sight, and the surgeon is prevented from making use of such means to rectify deviations in the line of the bone, as he would probably have otherwise employed.

For Hutchinson's splint[2] and Jarvis' adjuster, as a means of treating fractures of the leg, I have nothing but unqualified disapprobation. They have, either singly or together, cost the patient more suffering, and occasioned more maiming, than any other apparatus I have ever seen employed; and more than once the surgeons themselves have had to pay the sufferers for their losses.

In fractures of the leg, the *apparatus immobile* of M. Suetin, either in its original form, or in some of its various modifications, has demonstrated most favorably its capacities, and achieved its greatest triumphs; while, at the same time, it is in the treatment of these fractures, also, that it has proved occasionally most pernicious, and received its severest discouragements.

English and American surgeons now seldom employ it, except after the subsidence of the swelling, and not then, unless the circumstances are peculiarly favorable for its application.

For a very able and elaborate, but somewhat partial exposition of the principles which should govern its application, and of the mode of application, I will refer you to a work entitled *Advantages of the Starched Apparatus in the Treatment of Fractures and Diseases of the Joints*, by Joseph Samson Gamgee, London, 1853, and also to a work entitled *Surgical Research*, by the same author. London, 1856.

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[1] In compound fractures, the method of using the box, by filling it with coarse bran, first suggested by Barton, of Philadelphia, is to be preferred. See Amer. Journ. of Med. Sci., vol. xvi. p. 31, and vol. xxix. p. 515.

[2] Amer. Journ. of Med. Sci., vol. xx. p. 37. Coates on Fractures.

APPENDIX:

CONTAINING

SOME OF THE

AMERICAN INVENTIONS AND IMPROVEMENTS OF APPARATUS.

PLATE I.

FIG. 1.—PHILIP SYNG PHYSICK'S THIGH-SPLINT.

This splint is a modification of Desault's, and is constructed as follows: A long firm board, extending from the axilla to some inches beyond the foot, and furnished with holes at each extremity for the passage of the extending and counter-extending bands; Dr. Hutchinson has added also, at the suggestion of Dr. Physick, a transverse foot-piece. Another long inside splint, junks, splint-cloths, a padded perineal band, and adhesive plaster extending bands, with rollers, complete the dressings.

A majority of American surgeons employ this splint.

FIG. 2.—WM. GIBSON'S THIGH-SPLINT.

A modification of Hagedorn's splint, in which two long splints are used instead of one as recommended by Hagedorn; and both are extended well into the axilla. No perineal band is employed (counter-extension being effected by keeping the axis of the pelvis in a line with the axis of the body, and by pressure in the axilla), nor side-splints, nor bandages, except such as are necessary to secure the splint to the body.—*Institutes and Practice of Surgery*, by Wm. Gibson, 6th ed., vol. i. pp. 312–13. 1841.

FIG. 3.—WM. GIBSON'S SINGLE INCLINED PLANE.

Occasionally recommended by Dr. Gibson in fractures of the thigh. Both thighs are placed upon the inclined plane, and secured to the foot-board by gaiters (seldom used).—*Gib. Surg.*, *op. cit.*, vol. i. pp. 321–4.

FIG. 4.—WM. E. HORNER'S THIGH-SPLINT.

a. Long outside splint, extending into axilla, and padded, so as to avoid the necessity of junks; with fenestra, for extending and counter-extending bands; and also a foot-piece.

b. Short inside splint, made to extend from the perineum to the bottom of the foot; across the excavated upper end of this splint, a strip of leather is stretched to receive the pressure of the perineum, while the perineal band is made to pass through two firm leather loops on the outside of the splint.—*Treatise on the Practice of Surgery*, by Henry H. Smith, pp. 415–16. 1856.

FIG. 5.—JOSEPH HARTSHORNE'S THIGH-SPLINT.

Counter-extension is here also effected by the pressure of the cushioned head of the inside splint against the perineum. The head of the outside splint is padded in the same manner, but not with a view of using it for counter-extension. "In compound fractures, this outside splint may be removed, and the wound dressed without affecting the extension of the limb."—*Smith's Surg.*, *op. cit.*, vol. i. pp. 417–18.

Fig. 1.

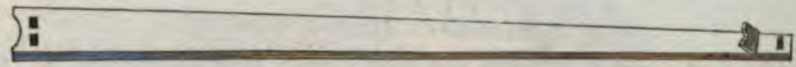


Fig. 2.

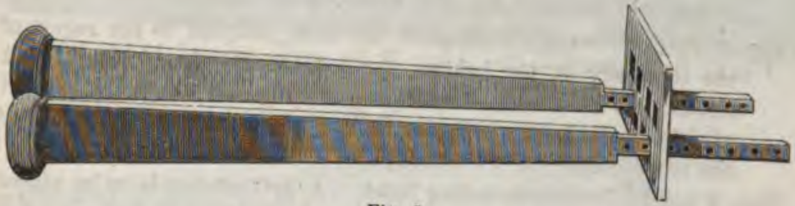
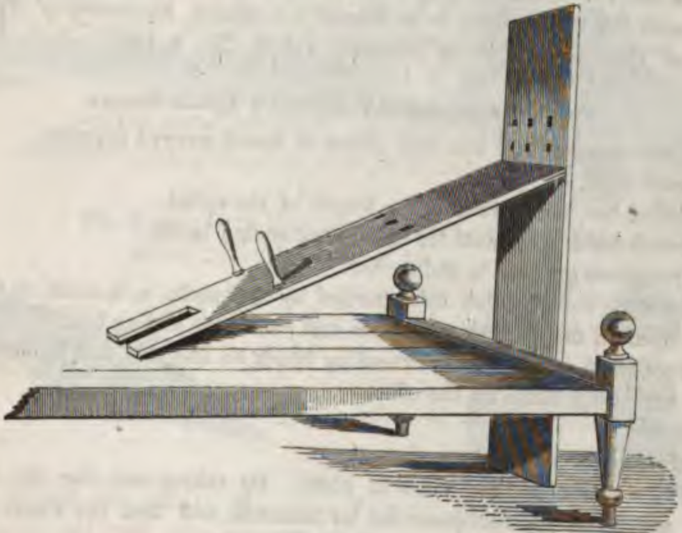


Fig. 3.



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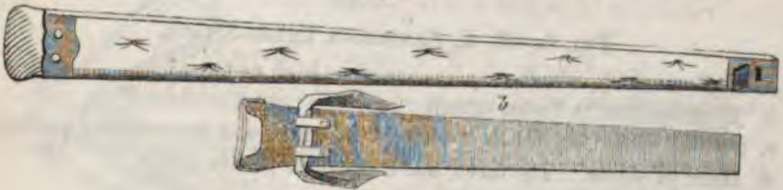

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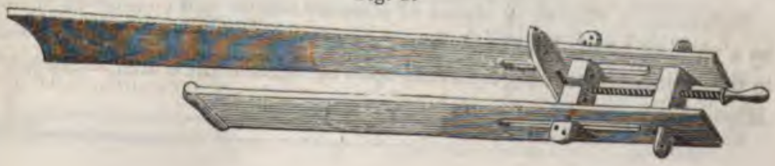


PLATE II.

H. HARTSHORNE'S THIGH-APPARATUS.

[illegible]. Apparatus, of outer and inner splints, counter-extending block, foot-board and windlass, and thigh-bandage. Extension to be made by adhesive plaster, fastened to the roller or windlass.

Fig. 2. Same, showing the shape of the block, adapted to the region of th[illegible]ty of the ischium, for counter-extension. The buttock sh[illegible] be protected by layers of adhesive plaster, to prevent [illegible]xtension is regulated by a pin inserted into the side of [illegible]oute[illegible]nt.

Figs. 3 and 4. Counter-extending block. A flat junk-bag is to be placed under the whole limb, up to the edge of the block; and one upon each side of the limb, as in Desault's.—*Quart. Summary of Trans. of College of Phys. of Philada.*, vol. ii., No. 9, 1855.

FIG. 5.—CHARLES AP. BOWEN'S THIGH-SPLINT.

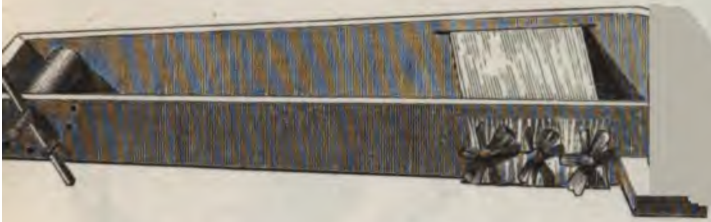
a. Splint composed of two thin pieces of board screwed together.
b. Brass band.
c. Sliding bar, for increasing the length of the splint.
d. Crutch-head, with slots for counter-extending bands.
e. Transverse grooves in sliding bar.
f. Eccentric roller, which being turned by its handle, *g*, is made to fasten itself in the transverse grooves and secure the sliding bar.
h. Foot-piece with slots for extending bands on one side, and for counter-extending bands on the other.
i. Screw.
j. Martingale counter-extension straps.
k. Pin which holds the screw in place. By taking out the pin, *k*, the screw and the foot-piece can be removed, and then the whole apparatus may be packed in a very small space.

FIG. 6.—E. K. SANBORN'S THIGH-SPLINT.

a. Sliding crutch, which may be carried as high as the axilla.
b. Thumb-screw, to fasten crutch.
c. Joint in splint, by which it may be separated and conveniently packed.
d. Head of screw. The screw has a range of twelve inches.
e. Cross-bar adjusted by screw.

Extension is effected by means of adhesive straps, and counter-extension by a perineal band; but the patient may at any moment relieve the pressure in the perineum by resting his axilla upon the head of the crutch.—*Sargent's Minor Surg.*, p. 182.

Fig. 1.



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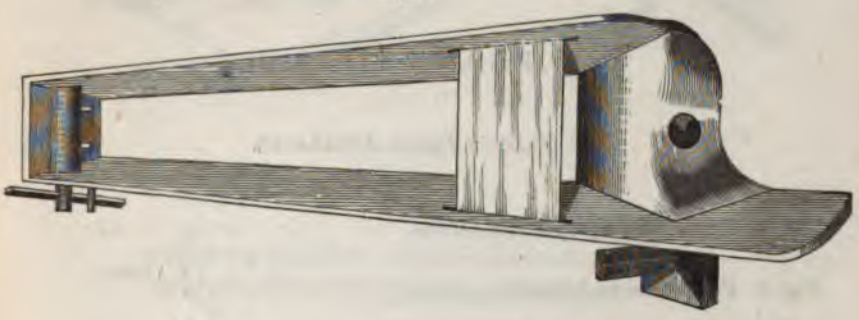

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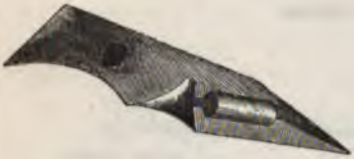

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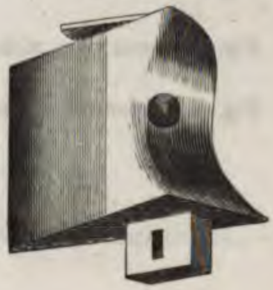

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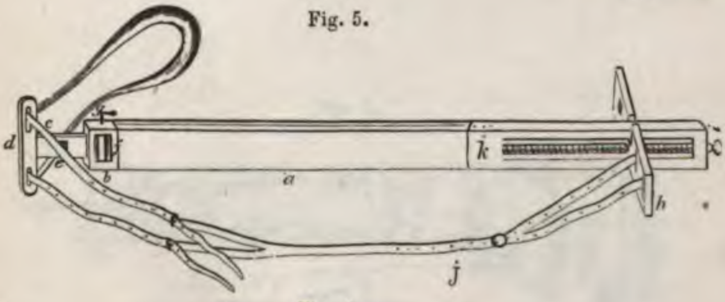


Fig. 6.

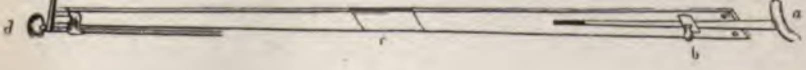


PLATE III.

J. F. FLAGG'S THIGH APPARATUS.

Fig. 1. Pelvic belt, and perineal straps.

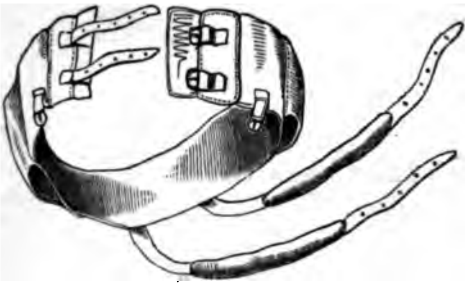
Fig. 2. Foot-piece and screw.

Fig. 3. Lateral view of the apparatus, without the belt.

Fig. 4. Front view, with folded sheet laid across.

Fig. 5. Apparatus applied.

Fig. 1.



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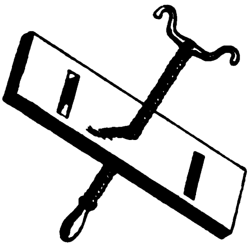

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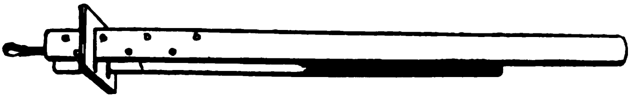

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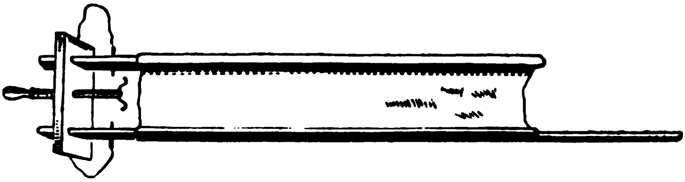

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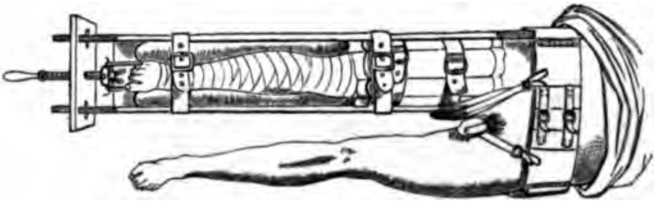


PLATE IV.

J. F. FLAGG'S THIGH APPARATUS.

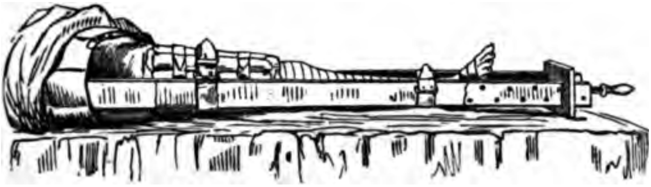
Fig. 6. Side view of apparatus applied.

Figs. 7, 8. Mode of making extension with adhesive plasters.

Fig. 9. Perineal band secured with a padlock.

"The belt is made of strong webbing, having pockets on each side, to receive the long splint. It is also furnished with straps and buckles. The perineal strap, corresponding to the injured side, is kept constantly buckled, while the other may be occasionally loosened, or left off, as its purpose is only to steady the apparatus. Where the straps pass under the perineum, they are covered with wash-leather. Before applying the belt, a pillow-case or two may be passed around the waist. The padlock is only to be used in case the patient persists in unbuckling the straps. The splints being applied, with also short side splints, junks, containing bran or sand, &c., are to be secured more firmly to the limb by bands of webbing and buckles. In using the adhesive strap extension, care should be taken to protect the ankles underneath the straps."—*L. M. S., Jr.* See *New Eng. Journ. of Med. and Surg.*, vol. x. p. 38; also *Boston Med. and Surg. Journ.*, vol. xxv. p. 223.

Fig. 6.



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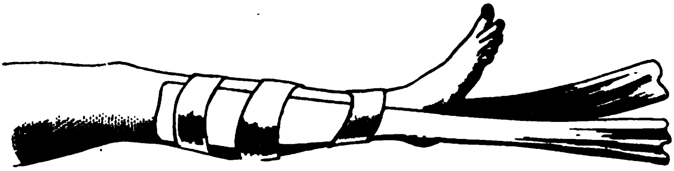

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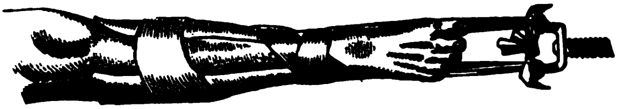

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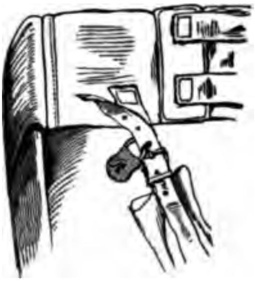


PLATE V.

JOHN NEILL'S STRAIGHT THIGH-SPLINT.

FIG. 1.—Extension and counter-extension, made at the same moment.—See *Phil. Med. Exam.*, vol. ii. p. 582.

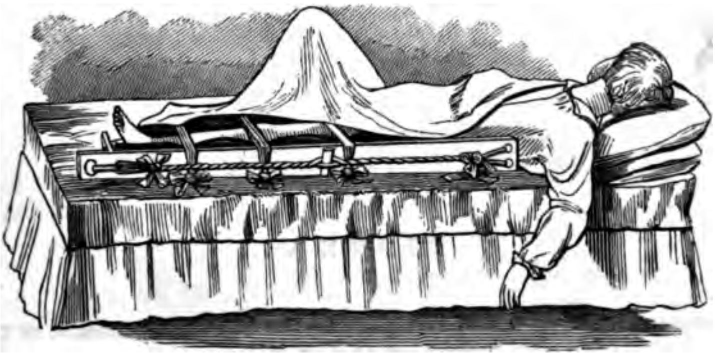
FIG. 2.—THE AUTHOR'S SINGLE STRAIGHT THIGH-SPLINT, FOR CHILDREN. See *Report*, p. 330.

FIG. 3.—THE AUTHOR'S DOUBLE STRAIGHT THIGH-SPLINT, FOR CHILDREN OR ADULTS.—See *Report*, p. 330.

FIG. 4.—THE AUTHOR'S SINGLE STRAIGHT THIGH-SPLINT, FOR CHILDREN OR ADULTS.

a. **Crutch-head, with two rings for the passage of the perineal band.**
b, b. Upper sliding portion of the splint.
c. Ratchet to secure the upper portion of the splint when drawn out.
d, d. Lower sliding portion of the splint, to which is attached the foot-block.
e. Foot-block, which, with the lower sliding portion of the splint, *d*, is moved upwards or downwards by the screw, *f*.
g. Brass ring fastened to the outer end of the foot-block. The perineal band having passed through the rings in the crutch-head, is made fast to this ring; so that when the foot-block descends, extension and counter-extension are made at the same moment.
h. Cross-piece, to steady the long splint.—See *Report*, p. 330.

Fig. 1.



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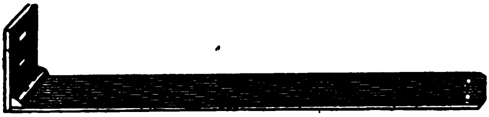

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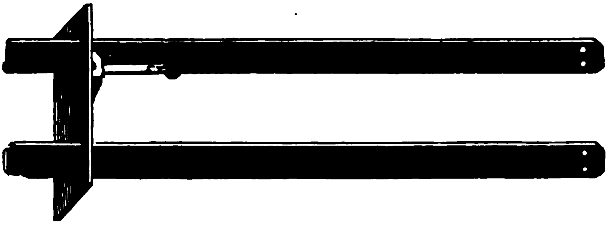

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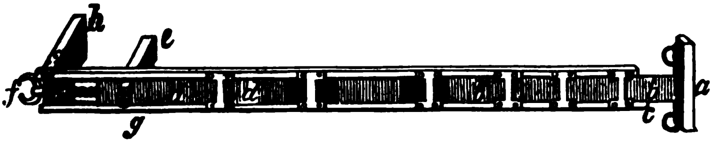


PLATE VI.

ENDLESS SCREW, USED BY THE AUTHOR FOR MAKING EXTENSION IN THE DOUBLE STRAIGHT SPLINT.

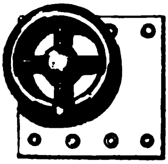
Fig. 1. Front view.

Fig. 2. Side view.

Fig. 3. End view. (*a*) is a screw working in a toothed wheel (*b*).

Fig. 4. Front removed, showing plane part of toothed wheel for extension strap. (*cc*). Two small screws to fasten extension strap.

Fig. 1.



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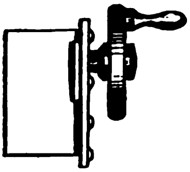

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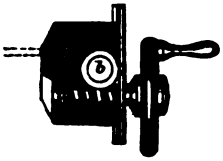
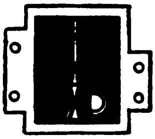


Fig. 4.



SCALE ONE-FOURTH OF FULL SIZE.

PLATE VII.

FIG. 1.—NATHAN R. SMITH'S APPARATUS.

This apparatus is constructed with especial view to lightness, cheapness, and portability. It is also so constructed that it may be conveniently suspended.—*Gedding's Baltimore Med. and Surg. Journal*, vol. i. 1833; also *Sargent's Minor Surgery*, pp. 171–2.

FIG. 2.—B. WELCH'S THIGH APPARATUS.

a. Upper extremity, broad and well cushioned so as to rest easily over against the side of the body. The breadth of this portion of the splint assists also in preventing its rotation. It is furnished with rings for the perineal band.
b. Brace for fixing a joint; to be used only in packing.
c. Screw for adjusting a sliding joint, for the purpose of lengthening or shortening the splint.
d. Thumb-screw for making extension.

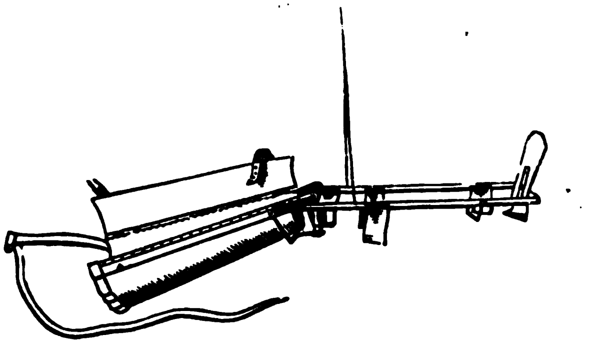
The hollow splints suspended below can be moved upon each other by a joint opposite the ham, and their position secured by a movable bar. They may also be lengthened or shortened. There is a joint corresponding to the heel, and another opposite the sole of the foot.

This apparatus may be used as a double inclined plane, or as a straight splint. Lateral splints accompany the apparatus, all of which are made of gutta percha veneered with mahogany. They are moulded and flexible.

FIG. 3.—JOSIAH C. NOTT'S DOUBLE INCLINED PLANE.

In this apparatus the limb is secured to the splint by vertical pins and leather straps; the upper surface of the thigh splint is carved out a little, to fit the thigh; the two portions are articulated by a joint like that of a carpenter's rule, and this joint may be steadied by a horizontal bar underneath. For the rest, the drawing sufficiently explains itself.—*Am. Journ. Med. Sciences*, vol. xxiii. pp. 21–28.

Fig. 1.



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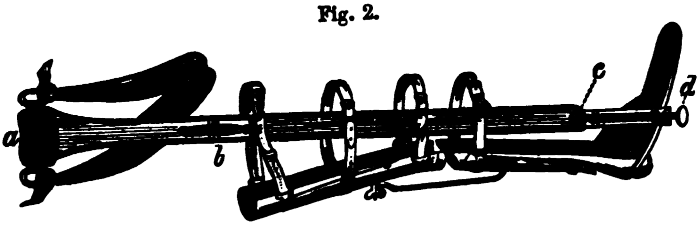


Fig. 3.

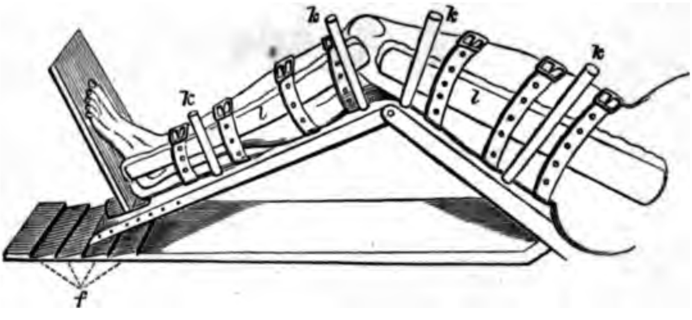


PLATE VIII.

L. A. DUGAS'S THIGH-SPLINT.

"Suitable compresses having been placed upon the thigh, apply over them four wooden splints a little shorter than the femur (one in front, one in the rear, and one on either side), and secure these with many-tailed bandages or with single ties. A two or three pound weight should then be fixed to the foot and hang over the foot-board of the bed, as indicated in the annexed figures, so as to keep up extension, while the resistance of the patient's body will effect counter-extension. A splint four inches wide, and extending from the side of the thorax to a little below the foot, will now serve to keep the limb straight and to maintain the foot in a proper position. This splint should be secured by separate ties passed around the abdomen, pelvis, thigh, leg, and foot. Finally, an arch of crossed hoops should protect the toes from the bedclothes."—See *Southern Med. and Surg. Journal*, Feb. 1854, p. 69.

Fig. 1. The long splint is omitted because it would mask the drawing.

Fig. 2. Illustrates the mode of securing the weight without fatigue to the ankle-joint.

Fig. 1.

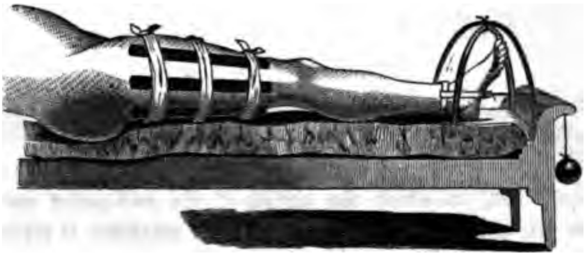


Fig. 2.

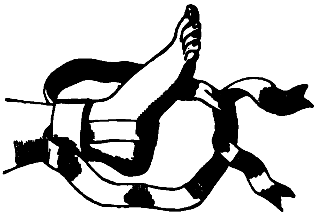


PLATE IX.

James L. Van Ingen's Thigh Apparatus.

Fig. 1. *a, b, c, d, e.* Small blocks or bricks to elevate the lower bed-posts, making an inclined plane of the whole bed.

8. A piece of board, one to two inches broad, nailed to the posts of an ordinary bed, to which the straps of the half-gaiter are attached. From this bar, or narrow strip of board, extension is made.

o. A very small oval pillow under the knee.

i. A wedge-shaped pad or pillow under the lower part of the leg, and terminating just above the heel.

Fig. 2. *a, b, c, d.* Bricks or blocks, same as in Fig. 1.

o, e. Pads or pillows, same as in Fig. 1.

i, i. A strip of cotton cloth, or of adhesive plaster, laid along each side of the limb, split at the lower end, and fastened to the foot-board, after having been secured to the leg by a few turns of the roller. This may be substituted at pleasure for the half-gaiter seen in Fig. 1.

Fig. 3. Same as Figs. 1 and 2; with *b, b, b,* splints of coaptation sewed in a splint cloth, to be used in fractures of the leg; and *g, g, g,* to be used in fractures of the thigh. Over the whole are lines representing a Scultetus bandage.

The pillow under the head should leave the neck and shoulders quite free, to allow the body to produce counter-extension.

Fig. 1.

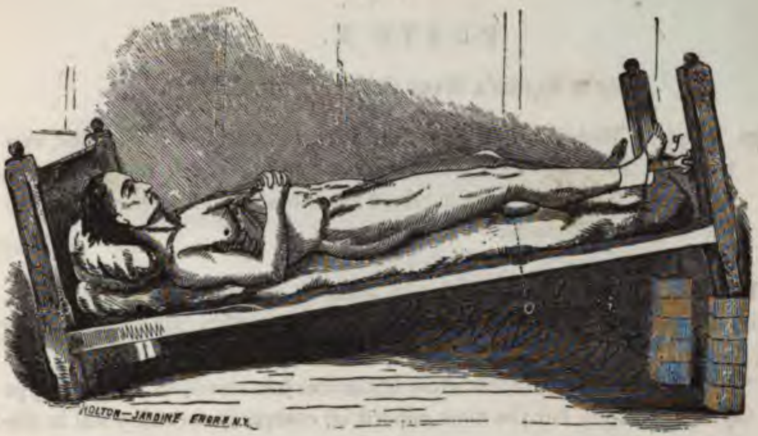
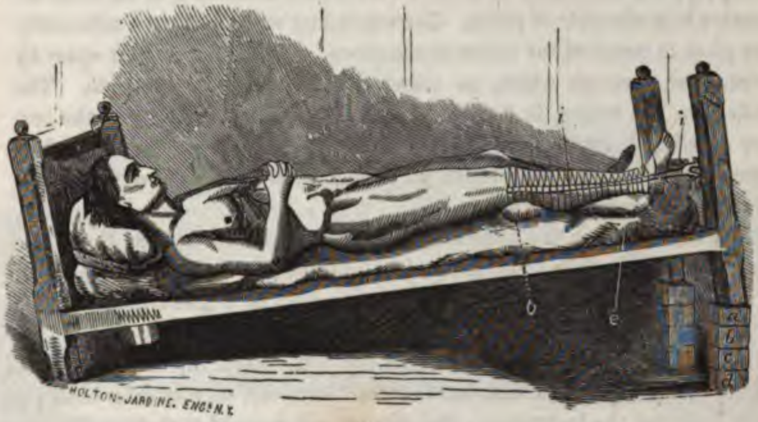


Fig 2.



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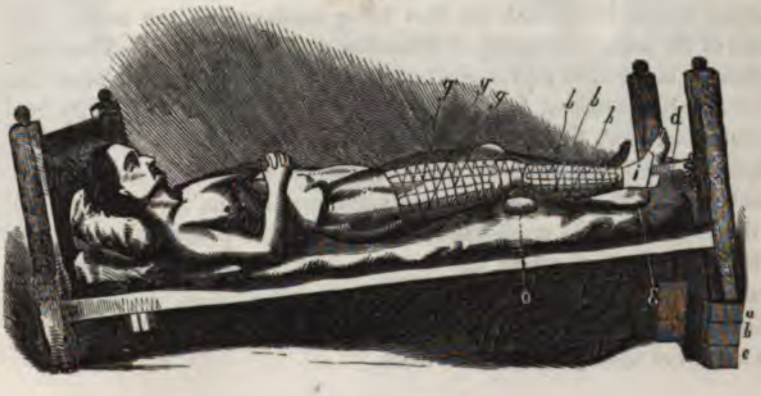


PLATE X.

LOUIS BAUER'S WIRE CLOTH THIGH-SPLINTS.

Figs. 1 and 2. Made of iron wire, tinned by a galvanic process, and varnished. The wire cloth is surrounded by wire frames to increase its firmness. The splints are moulded upon casts so as to adapt them to the shape of the limbs.

We copy the following paragraphs from an account of this apparatus, written by the inventor, and published in the *Buffalo Medical Journal* for April, 1857, vol. xii.:—

"Dzondi and Hagedorn's fracture apparatus has served as the prototype of my construction, but the most superficial comparison cannot fail in discovering the superior advantages of my apparatus over the former.

"My apparatus consists of a thick wire frame, similating in its form the posterior half of a pair of pants. Corresponding with the anus a sufficiently large piece is removed for alvine evacuations. Both legs are kept apart by an iron bar, through which, on either side, three holes are made. The middle one, the widest, is designed to receive a stout screw, and the two lesser openings a small piece of stoutish wire. The three being riveted to an iron foot-board, serve to move the said foot-board up and down, in all, perhaps, a space of three inches.

"In order to place the patient into my apparatus for any of the aforementioned objects, it is to be filled with loose cotton wool, and the calf of the affected or fractured limb, is to be surrounded by a lace stocking.

"So prepared, the patient is put into the apparatus; the foot of the sound member is to be firmly set upon the foot-board, the limb stretched and kept in this position with bandage and knee-cap, surrounding both the whole limb and the instrument, thus preventing the said limb from flexing. The fracture is then adjusted and the extension made by buttoning the lace stocking to the foot-board, the foot being bandaged on the latter. By means of the screw the degree of extension must be regulated. The thigh is then to be covered with a small wire splint in the front, and both the splint and limb fastened by a roller upon the apparatus; and, finally, the pelvis is kept down by a belt. This is the whole, and it will be easily perceived that the limb, thus secured, cannot move in the least, or the fractured bone be displaced. For the purpose of alvine evacuations, the lower portion of the apparatus is so much raised as to permit the placing of a bed-pan under the posteriors, which can be done without any apprehension concerning the security of the limb."

Dr. Bauer does not claim to have invented wire splints, but only that he has improved upon previous inventions.

Fig. 1.

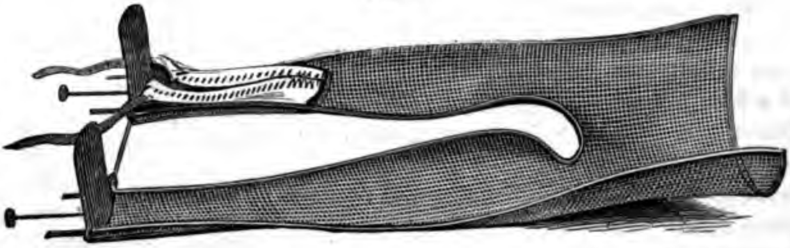


Fig. 2.

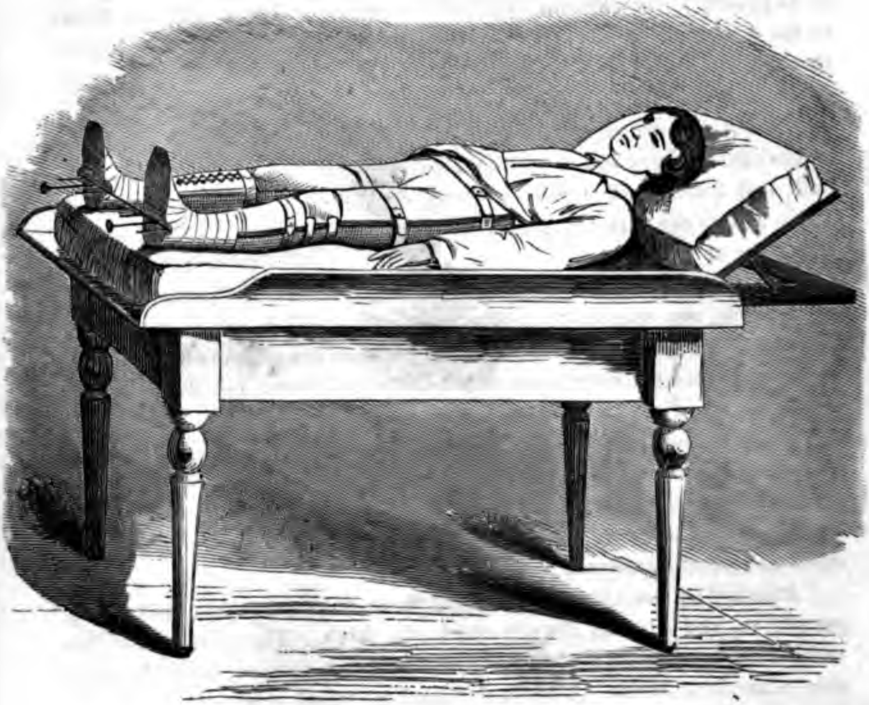


PLATE XI.

J. H. Hobart Burge and Brother's Thigh Apparatus.

"Figs. 1 and 2 consist of two short mattresses, constituting respectively the upper and lower portions of the bed, and also of a central portion, upon which rest the hips of the patient. This central portion is composed of a firm, but easy, hair cushion, upon which the hips of the patient lie. This cushion is secured to a board, one foot wide and two feet long, which lies transversely under the body of the patient. Both the cushion and the board present, at the lower margin, a large V-shaped opening, for convenience of defecation; and in order still further to facilitate this function, the cushioned board is elevated several inches upon a second platform, by a strip of board at each end, thus providing a shelf for the bed-pan, which is introduced through an opening formed by withdrawing a section of the lower mattress. Upon the cushioned platform, on each side of the cushion, is a rectangular wooden slide. These slides are so arranged as to be separated or approximated at will, and, by a thumb-screw which passes through a fissure in the horizontal portion of each, may be fixed at the desired point, so as exactly to embrace the pelvis of any patient. There is, also, a fissure in the perpendicular portion of each rectangular slide, and a screw passing through the same: one of these is to secure the upper end of the long splint, and the other for the attachment of a splint, eight or ten inches in length, both of which splints are well padded upon one surface, and may be elevated or depressed at will, in order to bring them to the level of the limb, and fixed at the proper altitude by the screws already mentioned. These splints are mutually transferable in order to adapt the apparatus to a fracture of either thigh.

"For the sake of distributing the pressure, and making the patient more comfortable, two counter-extending pads are provided, and to prevent all pressure in the groin these are attached by leather straps to the upper surface of the cushioned platform, upon which the patient rests, and about thirteen inches apart. Passing under the cushion, and traversing the tuberosities of the ischia, they pass between the thighs, and thence, perpendicularly, to a horizontal iron rod, at an altitude of eight or ten inches above the patient, transversely to his body, and directly opposite the perineum. This rod is supported by a perpendicular bar at either end, extending upwards from the cushioned platform already mentioned.

"Attached by one extremity to the horizontal cross-bar, is a rod running parallel to, and situated directly above, the thigh. The other end of this rod is supported by an arched iron bar, extending upwards from the outer side of the long splint. This is designed to afford direct support to the injured limb, whenever such support is deemed advisable, and to assist in

Fig. 1.

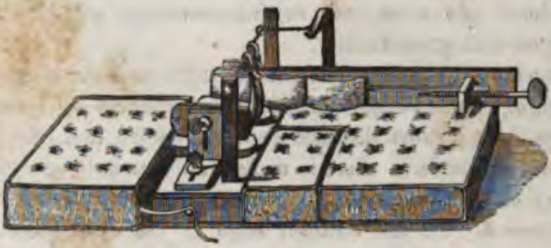
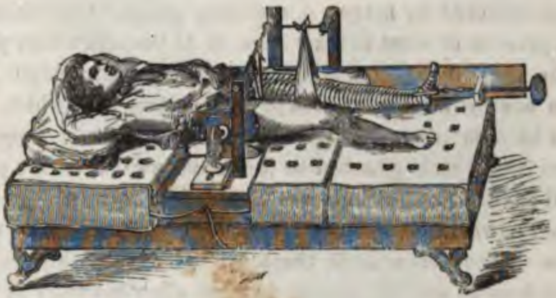


Fig. 2.



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preserving the arched form of the femur. A silk handkerchief, or one or two belts, of suitable width, are to be passed around the limb (either internally or externally to the splints of coaptation), and fastened to the horizontal rod. The splints of coaptation are not represented in the engravings: they are to be applied according to the exigencies of the case, and the views of the surgeon in attendance.

"The extension is made, as is usual in the straight position, by means of the screw, adhesive plaster and roller."

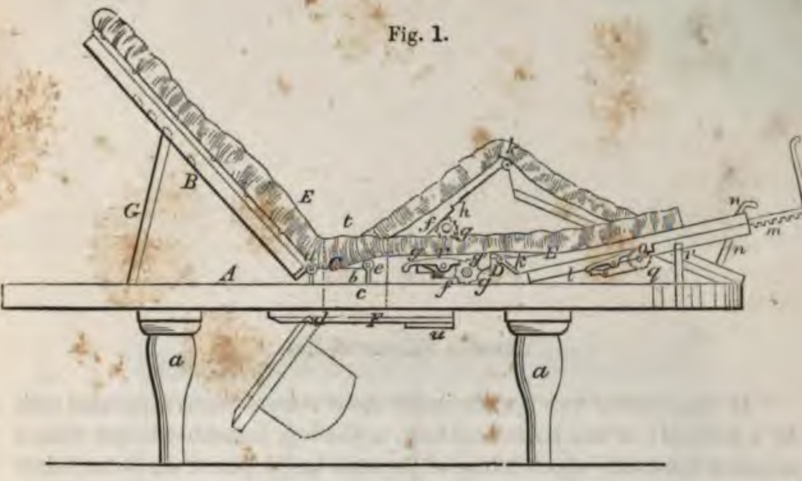
PLATE XII.

Figs. 1. 2. 3.—E. Daniel's Fracture-Bed.

"The nature of the invention consists in the peculiar construction of the bedstead, by which the position of the patient may be changed as often as desired without any annoyance or inconvenience, and the lower limbs operated upon with great facility.

"*A* represents a platform of a suitable length and width, and supported by four legs, *a*. To the upper surface of the platform *A*, there is attached a cross-piece, *b*, at a short distance from the centre, and directly through the centre of the platform there is made a circular hole or aperture, *c* (in dotted lines), said hole or aperture having a semicircular cut or recess in the cross-piece *b*. To the straight edge of the cross-piece *b*, there is attached by hinges, *d*, a board, *B*, termed the body plane, the width of which may correspond with that of the platform *A*, and when depressed its outer edge may be even with the edge of the platform. The sides of the body plane may be elevated or raised so as to be slightly concave on its outer surface. To the opposite side or edge of the cross-piece *b*, and at each side of the semicircular cut or recess formed by the hole or aperture *c*, there are attached by hinges, *e*, cast-iron plates, *C C*, which are provided with grooves or ways at their sides, in or between which plates, *D D*, work. The plates *C C*, *D D* (one on each side), are thigh planes, and their edges are provided with ease or projections, *f*, in which a shaft, *g*, works, one on each plate, *C*. On each shaft, *g*, there is placed a pinion, which gears into a rack attached to the under surface of the plates *D D*. At one end of the shafts, *g*, there are attached ratchets, *g'*, in which pawls, *j*, catch, said pawls being attached to the sides of the plates *C C*. To the outer edges of the plates *D D*, there are attached by hinges, *k*, boards, *E E*; these boards are leg planes, and are slightly raised at their inner ends, where they are connected to the plates *D*, in order to form depressions to correspond to the shape of the legs. To the under surface of each leg plane there is attached a metal guide, *l*, in which a rack, *m*, works; the outer ends of the racks have bars, *n*, projecting from them at right angles. To each leg plane there is attached a shaft, *o*, having a pinion, *p*, and ratchet, *q*, thereon, and pawls, *r*, which catch into the ratchets, *q*, the pawls being attached to the outer sides of the leg planes. The pinions gear into the racks *m*. The body plane, and also the thigh and leg planes, are covered by a suitable mattress, *E*, with a hole made through it to correspond with the hole or aperture, *c*, in the platform *A*, and the mattress is slit or cut to cover properly the thigh and leg planes without interfering with their movements. To the under side of the platform *A*, there is attached by hinges a flap *F*, having a stuffed pad or cushion, *t*, upon it, which, when the flap *F* is secured upward against the platform *A*, fits in the hole or aperture *c*, in the platform and mattress. The flap is secured against the platform by a button, *u*."

Fig. 1.



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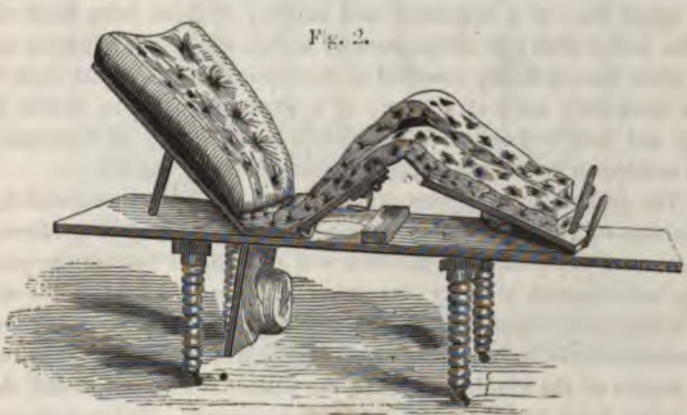


Fig. 3.

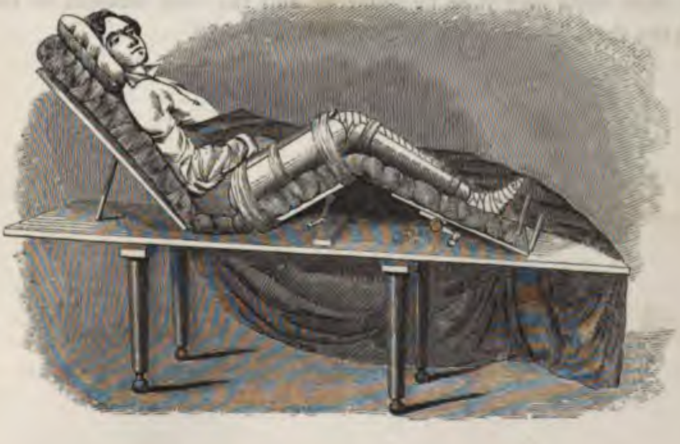


PLATE XIII.

Jenks's Fracture-Bed

"Is composed of two upright posts about six feet high, supported each by a pedestal; of two horizontal bars, at the top, somewhat longer than a common bedstead; of a windlass of the same length placed six inches below the upper bar; of a cog-wheel and handle; of linen belts, from six to twelve inches wide; of straps secured at one end of the windlass, and at the other having hooks attached to corresponding eyes in the linen belts; of a head-piece made of netting; of a piece of sheet iron twelve inches long, and hollowed out to fit and surround the thigh; of a bed-pan, box and cushion to support it, and of some other minor parts.

"The patient lying on his mattress, and his limb surrounded by the apparatus of Desault, Hagedorn, or any other that may be preferred, the surgeon, or any common attendant. will only find it requisite to pass the linen belts beneath his body [attaching them to the hooks on the ends of the straps, and adjusting the whole at the proper distance and length, so as to balance the body exactly]. and raise it from the mattress by turning the handle of the windlass. While the patient is thus suspended, the bed can be made up, and the fæces and urine evacuated. To lower the patient again, and replace him on the mattress, the windlass must be reversed. The linen belts may then be removed, and the body brought in contact with the sheet."—*Gibson's Surgery*, vol. i. p. 320.

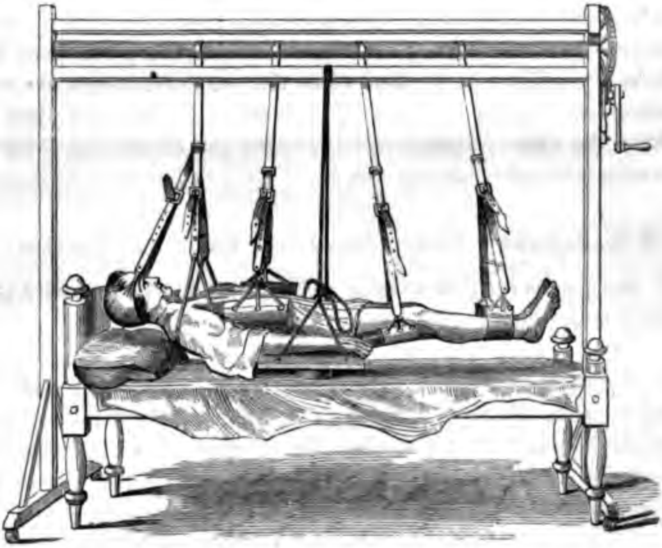


PLATE XIV.

JOHN SYNG DORSEY'S PATELLA SPLINT.

Fig. 1. This apparatus consists of a piece of wood half an inch thick and two or three inches wide, and long enough to extend from the buttock to the heel; near the middle of this splint, and six inches apart, two bands of strong doubled muslin, a yard long, are nailed. The splint is then cushioned, and the limb being laid upon it, a roller being first applied from the ankle to the groin, encompassing the knee in the form of the figure of 8; after which the two muslin bands are secured across the knee in such a manner as that the lower one shall draw down the upper fragment and the upper one elevate the lower fragment.—*Dorsey's Surgery*, vol. i.

E. K. SANBORN'S MODE OF DRESSING A FRACTURED PATELLA.

Fig. 2. Represents the limb covered with a broad band of adhesive plaster lifted into a loop over the knee.

Fig. 3. Represents the band of adhesive plaster secured in place by a roller, while the loop is being drawn together by torsion. Underneath the plaster, and just above the upper fragment of the patella, a compress is placed to aid the adjustment.—*Boston Med. and Surg. Journal*, vol. liv. p. 174.—*See Report*, p. 339.

Fig. 4. THE AUTHOR'S MODE OF DRESSING A FRACTURED PATELLA.

a. Bed.

b. Floor of splint.

c. Foot-piece, furnished with fenestra through which straps may be passed to secure the foot, and with pins on each margin.

d. Single inclined plane fastened to the foot-piece at any height by means of a hook dropped over the pins.

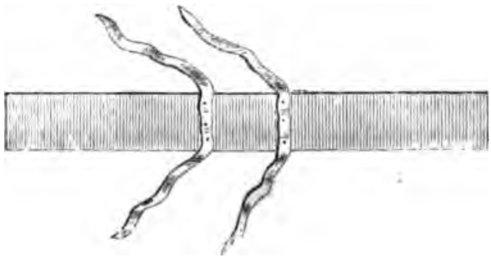
e, e. Cushion: thicker under the knee than at either end.

f. Roller to secure leg and thigh to the inclined plane: not completely applied.

g. Adhesive plasters laid over a compress and crossed under the splint. Those from above pass through a notch in the splint below the knee.

h, h. Ends of the compresses, seen from under the adhesive plasters.—*See Report*, pp. 340, 341.

Fig. 1.



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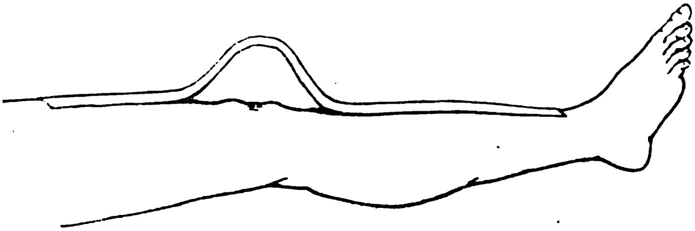


Fig. 3.

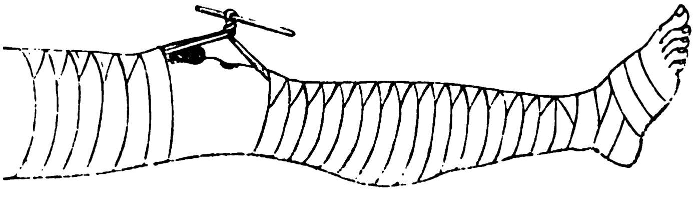


Fig. 4.

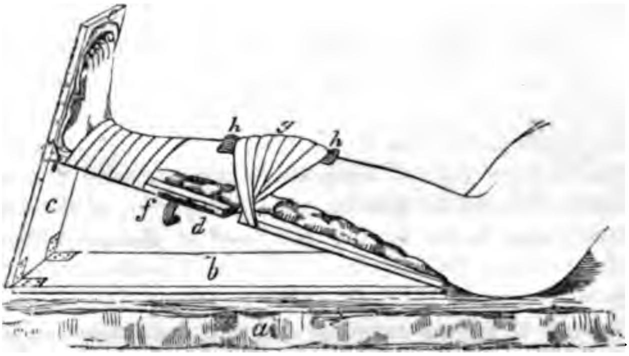


PLATE XV.

. 1.— TCHINSON'S SPLINT FOR EXTENSION, ETC., IN FRACTURES OF THE LEG.

Comp wooden splints, long enough to extend from the knee to six or below the foot, furnished with a foot-piece for exten n, and four holes above for counter-extension.—*Elements of Surgery, by John Syng Dorsey*, vol. i. p. 181. Philadelphia, 1813. (See my remarks on this splint in body of the Report.)

JOHN NEILL'S APPARATUS FOR FRACTURES OF THE LEG, REQUIRING EXTENSION AND COUNTER-EXTENSION.

FIG. 2.—APPARATUS FOR SIMPLE FRACTURES.

"For simple fractures of both bones of the leg, attended with shortening and deformity not easily overcome, the limb should be placed in a long fracture-box, with sides extending as high as the middle of the thigh, and a pillow should be used for compresses.

"The counter-extension is made by strips of adhesive plaster, one and a half inches in breadth, secured on each side of the leg below the knee, and above the seat of fracture, by narrower strips of plaster applied circularly. The end of the counter-extending strips may then be secured to holes in the upper end of the sides of the fracture-box, by which the *line of the counter-extension is rendered nearly parallel with the limb.*

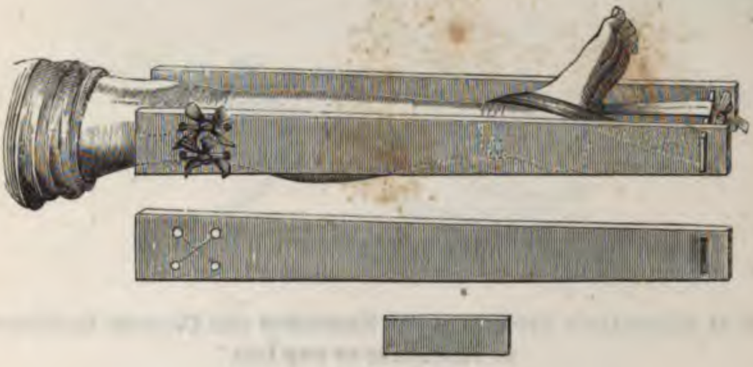
"The extension is also to be made by adhesive strips, in a mode which is now well known and understood. The ends of the extending bands may be fastened to the foot-board of the box."—*Philadelphia Med. Exam.*, vol. xi. p. 580, 1855.

FIG. 3.—APPARATUS FOR COMPOUND FRACTURES.

"In compound fractures of the leg, shortening and deformity are often difficult to overcome, as is well known to experienced surgeons. In such cases we may wish to dress the wounded soft parts, and, at the same time, maintain a certain amount of extension and counter-extension.

"This can be readily accomplished by having the sides of the fracture-box sawed in two parts at the knee, so that the sides of the box above the knee, from the upper ends of which the counter-extension is made, need not be disturbed during the dressing, while that portion of the side of the box, corresponding to the leg, may be opened at pleasure, without diminishing the tension of the extending or counter-extending bands."—*Phil. Med. Exam.*, vol. xi. p. 581. (See also, p. 582 of same volume for an ingenious mode of making extension and counter-extension at the same moment, in fractures of the thigh, invented by Dr. Neill.)

Fig. 1.



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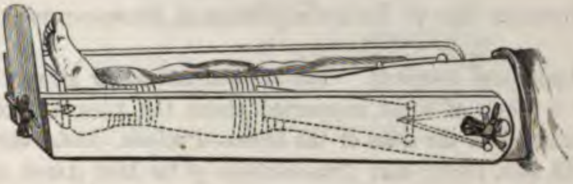

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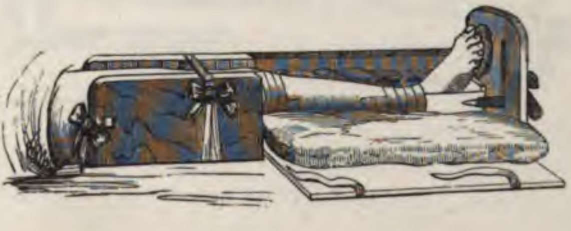


PLATE XVI.

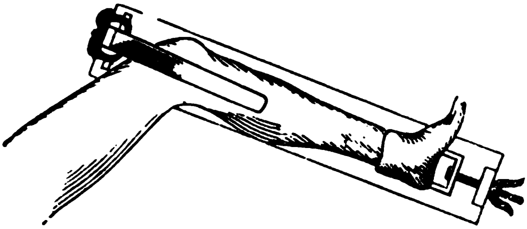
R. O. CRANDALL'S APPARATUS FOR EXTENSION AND COUNTER-EXTENSION IN FRACTURES OF THE LEG.

Fig. 1. Section of the apparatus, applied to the limb; showing adhesive plaster counter-extending band, gaiter for extension, &c. Adhesive plasters are also used for extension.

Fig. 2. Posterior view of the lower portion of the apparatus.

Fig. 3. Apparatus complete. **The counter-extending straps are passed** over a block of wood supported above the knee, to prevent their pressure upon the sides of the knee.—*Philada. Med. Journ.*, vol. iv. p. 193, Jan. 1856; also *Transactions of the Med. Assoc. of Southern Central N. York*, 1855, pp. 81–2.

Fig. 1.



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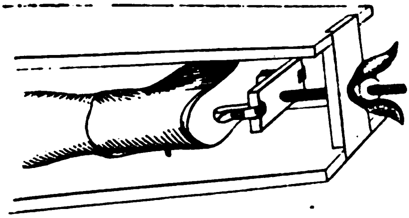

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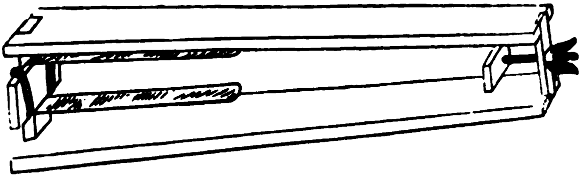


PLATE XVII.

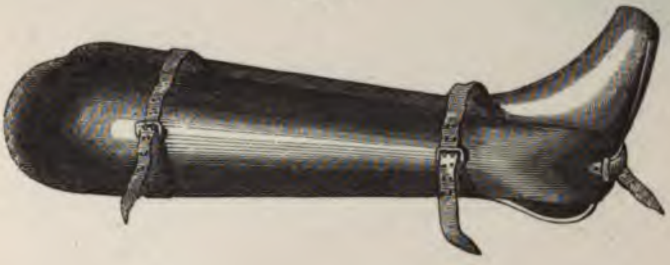
1.—B. WELCH'S SPLINTS FOR FRACTURES NEAR THE ANKLE-JOINT.

2.—B. WELCH'S JOINTED APPARATUS WITH FLEXIBLE SIDE SPLINTS FOR FRACTURES OF THE LEG.

s may be flexed or extended, and fixed in the position required by
es. This is done by means of pinion-like teeth at the circumfer-
e the hinges, which are held in contact by screws, forming the
pivots of the joints. It is fitted to limbs differing in length by sliding
joints at the sides of the limb, and in the splint which supports the under
side of the limb. The depth is increased or diminished by turning a screw
at the bottom of the foot-piece. Flexible side splints are confined by a
bandage to the sides of the limb; another may be placed on the top of the
thigh to support the thigh straps."

FIG. 3.—LOUIS BAUER'S WIRE SPLINTS FOR THE LEG.—*Buffalo Medical Journal*, April, 1857, vol. xii.

Fig. 1.



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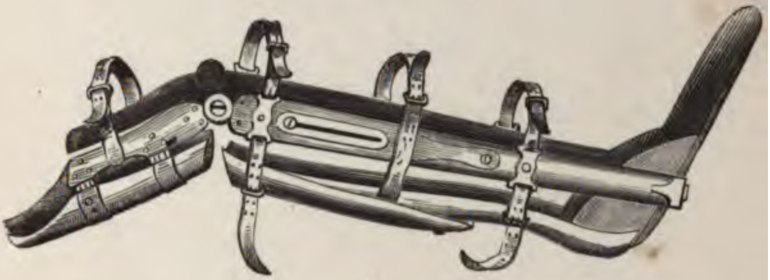
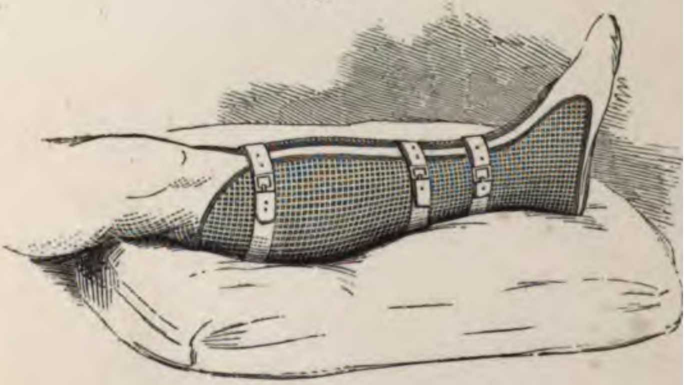


Fig. 3.



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